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A

PRACTICAL INQUIRY

INTO

DISORDERED RESPIRATION;

DISTINGUISHING THE

SPECIES OF CONVULSIVE ASTHMA,

THEIR

CAUSES AND INDICATIONS OF CURE.

BY ROBERT BREE, M.D. F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS.

THE FIFTH EDITION,

CORRECTED AND IMPROVED, WITH ADDITIONAL OBSERVATIONS.

> "Quis enim diu expirat? Omnia corporis aut incommoda aut pericula per me transierunt; nullum mihi videtur molestius. Quid ni? Aliud enim, quicquid est, ægrotare est; hoc est animam agere. Itaque, medici hanc meditationem mortis vocant."
>
> SENECA DE SUSPIRIO, EPIST. LIV.

London:
PRINTED FOR J. CALLOW, MEDICAL BOOKSELLER,
CROWN-COURT, PRINCE'S-STREET, SOHO.
1815.

MEDICAL SOCIETY OF LONDON

> "Porro observandum, quoties hujusmodi distinctionem morborum exponere conati fuerimus, id commodi oriturum, quod hujus distinctionis vel defectus, vel errores, facillime percipientur, et cum pecepti, vel ad observationes jam factas accuratius considerandas, vel ad observationes postea diligentius faciendas, ducent."
>
> CULLEN PROLEGOMENA.

BARNARD AND FARLEY,
Skinner Street, London.

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TO HIS ROYAL HIGHNESS

GEORGE PRINCE OF WALES,

REGENT OF THE UNITED KINGDOM.

SIR,

THE Work which, by your gracious permission, I inscribe to your Royal Highness, has been long established in the estimation of the Public, and the extensive utility of its principles has been confirmed by the approbation of the profession, and by opinions more impartial than my own.

My desire of perfecting its reputation by the high distinction of your Royal Highness's favor, is subordinate to the more anxious wish I have long felt of expressing my dutiful attachment to your Royal Highness. The disposition of your Royal Highness to bestow honors upon professional men has been often shewn. Your enlightened benevolence will suggest that medicine is amongst the most important of the sciences, as it combines with the curious investigation of nature the glorious purpose of removing the evils to which it is subject. Whilst the art which results from this combination is actuated by the motives which gave it life, it cannot cease to be honorable in itself, and beneficial to your people.

As a branch of philosophy therefore, medical science must interest the mind of your Royal Highness, and in its endeavour to alleviate human suffering, it will find a patron in your heart.

With the deepest sense of

Your Royal Highness's candor and kindness,

I am,

Sir,

Your most obliged

And very humble Servant,

ROBERT BREE.

Hanover Square,
May, 1815.

INTRODUCTION

TO THE SECOND EDITION.

THE first Edition of this INQUIRY was published with some precipitation, but though it had the faults of diffuseness, and want of perspicuity, it obtained the sanction in this country, and abroad, of names long celebrated in science.

After having been translated, upon the Continent, and noticed, with approbation, by the Professor of the Practice in the Edinburgh University, in his public lectures, it seemed to be entitled to improvement in a Second Edition, which had been much demanded.

It may, however, be remarked, that, in the copiousness of the first Edition, there are authorities, which, if I had not adduced, I might have expected the charge of assuming too much; as, by adducing them, I hazarded that of writing too much. Opinions on ASTHMA were so established, that facts which opposed them might have been denied, if full evidence had not been given in their support.

On this account I saw, with indifference, that the INQUIRY would be considered tedious by many readers who were not likely to assent to my method of proof, or to pursue an object which might invalidate a theory they had found agreeable, because readily practised upon.

I proposed to inquire, what had been really done by any Author, at any time, upon the subject of ASTHMA? In such a retrospect, repetition could scarcely be avoided; but it seemed to be necessary, in opposing with success, the obstinacy of modern prejudice. Ancient description corresponds with the present state of the disease, although modern observation very slightly acknowledges the resemblance. In our times, the principal feature in the most considerable

Species of the Disease is a subordinate object of attention; and if it were proved to be a cause by every other mode of evidence, demonstration would be still demanded before a material excretion, obvious to the senses, would be preferred to the theory of an invisible action that had rivetted the attention of the Schools.

I therefore took the aid of dissections, to which I owe a part of the facts leading to a conclusion.

It may be said, that the appearances in these dissections did not belong to cases of Convulsive Asthma, or that they were effects of the disease: but compare them with the description of CÆLIUS AURELIANUS, and afterwards with that of Dr. BEDDOES, in the instance of Mr. BAYNTON'S patient, and the identity will be manifest. Will the objectors to minute inquiry see no advantage in this coincidence of character and description? and, if they do, is it a matter of indifference that the ancients should be examined for the purpose of recovering a natural record that had been suppressed or lost?

Thus the most copious effusion may happen, in one Species of Asthma, and the patient may recover; and the effusions that were found by dissection were not necessarily *effects* of disease, and still less probably the consequences of death.

That diseases alter by time or climate may be an argument against going out of our country, or looking beyond the present period for information. But it can scarcely be considered probable, that one of the strongest features of a disease of so peculiar a character, should be erroneously described in every age; or, if truly described, that it would suddenly disappear in this age, and in the meridian of Edinburgh.

But the doctrine that ASTHMA existed *without a manifest cause, or any attendant disease*, superseded demonstrated facts, and was calculated to produce the worst effects in practice.

I must, however, disclaim the intention of depreciating the high reputation which is due to the memory of Professor CULLEN. I confine my objections to his theory on ASTHMA; nor do I offer them with satisfaction. I respect and value his labours, which have been so conducive to the interest of medicine. Were his successor to deliver a doctrine, that I had found questionable and productive of uncertainty or inconvenience in practice, I should not hesitate to give an opinion, opposing its influence. But for Dr. GREGORY, I have a friend's regard, united to a pupil's gratitude, and respect matured by long reflection on his talents. A contest, with a view to perpetuate posthumous fame in every particular of an extensive system, is more than the late Professor ever meditated upon: and it will be an arduous task to maintain it. "Rational Practitioners," says a liberal and judicious writer, "disdain to rank themselves as "implicit followers of any dogmatist, how- "ever celebrated;" yet others more captious would preclude the questioning of tenets they had themselves received; or the examining, with impartiality, the opinions of the dead.

In a friendly intercourse and correspondence with Dr. BROWN, principles were discussed rather than dictated. I never observed his kindness to cool in consequence of my opposition to particular points, which I thought his ardour carried too far.

His system is not more prejudicial to industry than the Spasmodic theory, as it regards ASTHMA, seems repugnant to investigation. It affords a constant resource to the indolent or incurious from the trouble of tracing a cause, really existing in some material to be removed, or some injured function to be restored.

The usage and authority of a few years made it necessary to go back for ages into the history of ASTHMA, whilst the *onus probandi* should have been sustained by those who gave the disease a new character. I endeavour to prove the negative of their proposition, affirmed in defiance of all former observations, and which they offered no evidence to support.

But the most valuable object in recovering the original history, is the means it supplies of explaining the principle of other species, where the cause is less clear.

It has been said that citations of authors are not a certain proof of learning; but if an acquaintance with these authors were essential in an important inquiry, I think that before it were attained, the inference from the want of it would be determined to be a just, or a fallacious one.

Having experienced the bad effect of reading, I had not applied to medical books for a considerable period, and was not gratified by the perusal of Zoonomia till the year 1796, when it had been some time published. I had previously satisfied my mind as to the principles of the disease I had suffered; and I then saw, with great emotion, that they were supported by the pathology of that admirable work, whilst my views were enlarged by the rich assemblage of natural facts that it contains.

It is no uncommon thing to contemplate a fact newly proved, without surprise, though its existence had previously been disputed, or even considered impossible. Some carry this apparently artless, and incurious manner to a great length. They do not assent to a position, nor oppose it; but, when convenient, embrace it, as a portion of established knowledge, which having been long acquired, had become familiar.

If the Public were possessed of the causes of the Species of ASTHMA before my INQUIRY appeared, it must have happened by accident.

No one had looked at the external signs as effects from which causes could be traced; the signs themselves were not clearly understood, and still less their indication.

It is easy to assert causes, but the method of induction can alone establish their value and truth. The result may be called theory; but a collection of inferences drawn from facts, is entitled to practical confidence, and a sanction which can never be given to any theory founded on mere hypothesis.

But inferences, from facts, will not always be the same; and I am far from assuming that mine are infallible. I have attempted a method that is apparently proper, and it has produced me a portion of success on which I reflect with satisfaction.

Theories, built upon hypothetical foundations, are one cause of the turn for quackery that infests this country: and an authoritative delivery of principles that are confuted by nature, may be as injurious to the credit of physic here, as the tenets of blind bigotry in other countries, have been to the professed objects of morals and religion.

And yet it is to be lamented, that useful research in medicine is frequently disdained; and, that copious as the *materia medica* is, the high-sounding praise of some new article, is more countenanced than a just distinction of diseases, which can alone insure it a successful application.

The experienced and the grave are confounded, or abashed into silence, by the confident assertions of the bold and superficial; and, when the bubble bursts, they too often permit the author to escape from his own recollection of what he had promised. Are not these practices so nearly allied to plain empiricism as to deserve contempt and reprobation, instead of credit and protection? But if Physicians yield to the impulse, we cannot be surprised that a credulous Public should follow their example.

In fact, empiricism seems to infect all ranks, and to meet with so little opposition from the adherents of science, that the former seduces multitudes to her standard, while the latter, by a sort of negative connivance, seems to favour the desertion.

The predisposition to this mania is man's ignorance of his own body, and the natural laws that regulate its motions. It is of general interest to know, that the external muscles re-act in a convulsive manner to relieve the internal functions from injury or interruption: and that Convulsive Asthma is a muscular re-action to accomplish this object.

If true principles, exertion, and disinterestedness, be neglected, we may at length be mortified by that state of public opinion which prevailed at Rome when the books of HIPPOCRATES were contemned, and the nostrum of Mithridates was inquired for with solicitude.

JUNE; 1800.

TO THE READER.

THE Public are presented with a Fifth Edition of this Inquiry.

The great demand for the work may be attributed very much to the general consideration of the principles which have been unfolded in it, respecting causes, particularly of the Third Species of Asthma.

It is the author's intention to offer some further observations on the connexion between disorders of Respiration and certain morbid Affections of the Viscera, that had not been considered as causes in the general practice.

These will be submitted to the indulgence of the public in a short time.

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A
PRACTICAL INQUIRY
INTO
DISORDERED RESPIRATION, &c.

PART I.

SECTION I.

Asthma a general name for disordered respiration.—Violent muscular action indicates IRRITATION; as in the stomach, gall duct, bowels.—Irritation in the pulmonary organ.—DIFFICULTY OF BREATHING, this term does not explain the natural fact; always to be referred to IRRITATION.—A more precise idea of the instruments of convulsive respiration.—Analogy of the perception of IRRITATION in the lungs, and in the rectum and bladder.—Motus Medicati of Gaubius.

ASTHMA, in its original meaning, long continued to embrace all the cases of difficult respiration: but nosologists have lately confined the term to a peculiar form of this general affection. If we go back to the time of WILLIS, we shall not find in the period which has elapsed since his writings appeared, much improvement in the pathology or treatment of this disease. "Asthma," says this author, "dicitur ab ασθμαινειν, (quod est anhelare, "sive difficulter respirare) et describi potest quod "sit *respiratio difficilis, crebra, et anhelosa, cum "magna pectoris agitatione, et plerumque citra "febrem*[*]."

Frederic Hoffman gives the same latitude to the term in the following description:

"Hoc vero (Asthma) secundum nostram sen-"tentiam nihil est, quam *impedita et laboriosa "admodum respiratio, cum ineffabili anxietate, et "præcordiorum angustia juncta, liberum sanguinis "per pulmones circuitum turbans, a variis causis "suborta, periculi suffocationis non expers*[†]."

These authors adopted the Greek word as the head of a class of specific forms, and afterwards distinguished the several causes which, according to their observations, were productive of that uniform apparent effect, "difficult respiration."

If it be necessary to define the disease, I would say, agreeably to the principles of the following Inquiry, Asthma *is an excessive contraction of the*

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[*] Thomæ Willis Opera Omnia. Geneva, 1680. Tomus Posterior, caput xii. de Asthmate.

[†] Frederici Hoffmanni Medicin. Rationalis Systemat. tom. III. sect. II. cap. II. § II.

muscles of respiration, without acute fever, excited by an irritation in some of the viscera whose functions these muscles are intended to serve.

Under this generic definition are comprehended all affections not febrile, attended by an uncommon action of the muscles used in respiration. The influence on these muscles being the same in kind though distinct by situation and quantity of force, as it may exist in some of the lower viscera, or in the lungs. In the species of asthma commonly termed *convulsive or spasmodic*, the muscles are contracted with more violence than in any other, but the contractions, in this case, do not obey any law, nor assume any form which is not common to the action of the same muscles in milder instances of dyspnœa.

The difficulty of assigning to a disease its true origin, will be considerably encreased if we neglect a strict observation of its characteristic symptoms; but Asthma has been more subjected to the caprice and hypothesis of prevailing theories, than any other disease whose appearances could be as distinctly traced to a material exciting cause.

Spasmodic contractions of the alimentary canal, excited by particular causes of irritation, have been considered by all physicians as clear evidence of the impatience with which the animal system suffers the slightest interruption of its functions. It is agreeable to reason and philosophy to infer that such actions, in whatever organs they occur, are at first exerted by nature for some salutary end. If a material stimulate the stomach, by its quality or quantity, so far as to impede the digestion of food, it must be ejected for the safety of the body. If a gall stone, by stopping the duct, prevent the discharge of bile into the bowels, the muscular actions are increased, and their excess is intended to remove the obstruction. If scybala be included in the cells of the colon, the natural peristaltic motion is suspended, or becomes irregular as soon as this inconvenience is felt. Convulsive contractions next take place, and continue till the offending matter be discharged.

ALEXANDER MUNRO, senior, has stated the nature of muscular exertions for the relief of the body, as follows: " Whenever the uneasy sensa-" tion, pain, is raised by the too strong application " of objects, a sort of necessity is, as it were, im-" posed upon the mind, to endeavour to get free of " the injuring cause, by either withdrawing the " grieved part of the body from it, as one retires " his hand when his finger is pricked or burnt; or " the injuring cause is endeavoured to be forced " from the body, as a tenesmus excites the con-" traction which pushes acrid feces out of the " rectum. In both these operations, a convulsive

" contraction is immediately made in the lesed part " or in the neighbourhood of it ; and if the irritation is very strong or permanent, the greater part " of the nervous system becomes affected in that " spasmodic or convulsive way*."

Whether the disorder be idiopathic, or symptomatic, it will generally affect the nervous system with convulsive motions. An effect soon becomes a cause, and maintains that disorder by which it was at first produced. Convulsions naturally follow the irritation of a fibre, and may be justly considered as evidence of some injury to be repelled, or some offensive matter to be discharged†.

But if these laws of nature have been applied in some instances of violent muscular contractions, yet have the causes of the convulsions of Asthma in the thorax or abdomen, been much neglected, though it is equally conformable to such laws, that any extraordinary irritation in these cavities may bring on an association of actions of all the muscles of respiration ; and there is clear evidence in many cases that it produces effects which are common to all the species of Asthma.

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* ALEX. MUNRO, senior, on the Nerves, 66. k.

† Vide Zoonomia, vol, I. sect. VIII. and X. 2.

If a vomica, or some other inconvenience equally oppressive, exist in the lungs, the cause of the difficult respiration admits of little doubt; but even here Physicians have spoken vaguely of a mechanical obstruction, instead of explaining the fact by referring to a principle which is inherent in the animal economy, and perfectly conformable to its laws.

Asthma is said to be distinguished by difficulty of breathing. "*Spirandi difficultas*[*]." But it is necessary to understand in what sense this expression is to be taken; since terms may have been long applied to a disease, and received by prescription as a proof of its character, when a close examination may show the fallacy of the conclusion.

It is certain, that when no unnatural cause of irritation exists, the functions of the lungs are carried on in the calmest manner, and there is neither an excitement to a full inspiration, nor the necessity of renewing, by one effort, the whole measure of air which filled the cavities of the organ. The act of respiration has frequently been so imperceptible in some conditions of the body, that observers have been uncertain whether life were extinct or not.

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[*] CULLEN, Nosolog.

The quantity of air inspired also varies in different men, and in the same man at different times: hence philosophers have not coincided in their accounts of the measure of air taken in at each inspiration.

Borelli* makes the quantity to be from 15 to 20 cubic inches in one ordinary inspiration, whilst Dr. Goodwin says, the greatest quantity received in the same act, is 12 cubic inches, expanded in the lungs to 14.

The quantity usually expired is equal to 40 cubic inches, as stated by Messrs. Jurin, Hales, Haller, Sauvage, Menzies, &c.

Dr. Goodwin† informs us, that the air remaining in the lungs after a complete expiration, is 109 cubic inches, and that the proportions of the dilatation of the lungs, before and after a healthy inspiration, are as 109 to 123‡.

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* On the Motion of Animals, p. 119, 133.

† Connection of Life with Respiration, p. 27.

‡ Goodwin, p. 37.

But according to Dr. MENZIES*, the dilatation of the organ in the same circumstances, is in the proportion of 179 to 219.

There is, therefore, in health, no determinate quantity of air consumed in respiration in a given time; and in disease, if an organ of the breast or belly be not irritated, the respiratory muscles are not forced into any unusual action, though the difference between the efforts of "an *ordinary* "and *full* inspiration, is as 14 to 200 cubic "inches †."

The *difficulty* may then be said to consist in obtaining, at each inspiration, a measure of air equal to 12 cubic inches, which is sufficient for the system in ordinary health: yet it is not shewn with how small a proportion of atmospheric air life may be sustained, whilst its purity remains at the usual standard. In sleep the inspirations become less frequent, and sometimes are not attended with any perceptible elevation of the breast.

Divers in the pearl fisheries are said to remain under water half an hour or longer. DIEMER-

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[*] MENZIES on Respiration, by SUGRUE, p. 32.

[†] Vide Dr. GOODWIN, p. 32, note.

BROECK* relates an instance of a diver who remained in the sea that length of time under his observation.

A rustic appeared to die of the plague, and after three days discovered no signs of respiration, but on being carried to the grave recovered, and lived many years afterwards†.

Instances of apparent death from drowning are numerous, and consequent recoveries since the establishment of the Humane Society are authenticated beyond suspicion or doubt, to the honour of that invaluable institution.

Many curious histories are extant of persons roused from the tomb of death by accident or design, and may be seen in DIEMERBROECK, Lib. II.—JOANNES MATHEÆUS, Quæst. Med.—PHILIP. SALMUTH. Cent. 2. Obs. 86, 87, 95.—HILDANUS, Cent. 2. Obs. 95, 96, and other writers‡.

It would appear, therefore, from these circum-

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[*] Anatomes, lib. II. p. 464.

[†] DIEMERBROECK, Tractat. de peste, lib. IV. hist. 85.

[‡] Add to these facts, the curious relations of the discovery of living toads in the stems of elm and oak trees, by the Academy of Sciences of Paris, 1719, 1731.

stances, that the animal œconomy will admit of great latitude, and still maintain the exercise of its functions, though the quantity of air inspired be much smaller than it is possible to ascertain.

HALLER attributes to the act of expiration, such a condition of the lungs as even obstructs the circulation of the blood through them.

" In expiratione vero pulmo undique urgetur,
" et in multo minorem molem comprimitur, vasa
" ergo sanguinea breviora quidem fiunt cum re-
" tractis bronchiis, eademque angustiora nunc
" sunt, siquidem pectus secundum tres suas di-
" mensiones arctatur*."

In this state of collapse recurring at every expiration, we should, at all events, experience great distress alternating with the inspirations, if the freedom or difficulty of breathing were to depend very critically on the portion of air received from the atmosphere into the cavities of the lungs. This nicety is not essential to the œconomy of the pulmonary system in its healthful state, but as soon as the organ feels the inconvenience of any unnatural compression, the muscles are excited into more energy of action. If the compression be

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[*] HALLER, lib. VIII. sect. 4.

external to the air cavities of the lungs, the labour will not be so great as if the cavities themselves were obstructed, so that all the symptoms of Periodic Convulsive Asthma may not take place, but such as distinguish the *Continued Asthma* or *Dyspnœa* will attend.

Whenever, then, some compression, or organic derangement irritates the lungs, the effort which has been commonly called *Difficulty of Breathing*, is excited. In the instance of hydrothorax, the compression arising from an extraneous material, there is considerable dyspnœa, but in the expiration of HALLER the compression being a natural operation of the system, it is not attended with uneasiness, and scarcely with conscious perception.

It may, therefore, be concluded, that this popular term, *Difficulty of Breathing*, can only refer to such extraordinary contractions of the respiratory muscles, as are designed to remove offence; there being no data in existence to prove that the functions of the animal system will be stopped by the atmospheric air being diminished to any specific measure, however small, in ordinary respirations.

But besides this mistake, respecting the final cause of extraordinary respiration, some confusion of ideas has prevailed, as to the means of relief employed in Asthma. The instruments which nature can alone call into action for her relief, when the lungs are injured or oppressed, are the muscles which act externally in expanding or compressing their cavities, for the purpose of inspiring or expiring air.

The convulsions are, therefore, external to the lungs as far as any appear. It is not, however, wonderful, that a mistake should have occurred, as to the proper instruments of relief, since almost all the motions called *spontaneous*, are performed without our consciousness; and in some of these, not only the muscles employed, but the effects of their actions are unknown.

The muscles of respiration are capable of spontaneous actions, and the constant repetition of such actions induces paroxysms, frequently without a perceptible interval between their common standard and their excess of exertion. When the excess becomes considerable, it brings on the associated contractions of other muscles, and the irritation, which they are intended to discharge from the cavities of the breast or abdomen, is so acutely felt as to turn the patient's attention entirely to the seat of the cause. There may be the additional cause of this sensation in constrictions of the bronchia corresponding with the external contractions, but of this state there has yet been no proof.

The subject is illustrated still more by an irritation in the intestinum rectum. All the attention of the patient is then turned to the excruciating tenesmus, but it is certain that the violent peristaltic action above the rectum, and the strong contractions of the abdominal muscles and of the diaphragm, are the means employed to discharge the offence, and also very materially occasion or increase the pain in the part where it rests.

In the discharge of urine the chief perception of irritation is in the bladder; but if the muscles which have been stated to act in expelling the feces, did not contract with great effort, the perception could not be so strong, since the propelling of the contents of the bladder towards its neck must precede the relaxation of the sphincter. Yet the attention of the animal rests upon the effect, and the particular seat of the cause of these efforts, although no motion be at present performed by the bladder. Afterwards, by the uniform and steady contraction of its own muscular coat, the urine is expelled*.

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* MUNRO on the Nervous System, chap. XXVIII.

Exactly this degree of perception of a stimulus excites the actions of the respiratory muscles when the lungs are to be relieved. And the mind seems to have the same degree of consciousness of the effect to be produced whenever the irritation may be said to create *anxiety* and *stricture about the sternum.*

We have hitherto supposed that the irritating cause of Asthma may chiefly exist in the lungs, but the definition of this disease implies that it may also exist in some of the abdominal viscera: a position which may be defended by the most certain principles of physiology, and which I hope to establish in the progress of this Inquiry.

The contractions of the respiratory muscles are really *motus medicati*, as GAUBIUS terms them in the following just description:

"Multifariæ autem, quibus corpus vivum pol-
"let, vires motrices, quum rebus nocivis irritatæ
"semet exserunt, præcipuum præstant vitæ ac
"sanitati præsidium.—Inde profluunt motus auto-
"matici, irregulares quidem multimodis, et sæpe
"beneficentissimi certaque determinatione ad sa-
"lutarem finem tendentes; etiamsi mente nec im-
"perante, nec conscia, et vel invita quoque, fiant,
"hujusque adeo consilio nequaquam tribui pos-

"sint. His si careret homo, nulla vel sanitati
"constantia, vel morbo medela foret*."

For the further advance of this object of restoring health or averting evil, sympathies are established in the animal œconomy, which rapidly excite an unity of effort of muscles which at first are intended for separate duties. "Accedit partium facultatumque consensus ac conspiratio "qua mutuam sibi opem ferunt, aliæ aliarum vice "funguntur, sanæque pro afflictis in motus medicatos ruunt; ut horum junctis viribus tanto "minus resistere imminens præsensve morbus "possit†."

It is very convincing that the muscles of respiration may be so habituated to the influence of this sympathy, as to be excited to contract from various and apparently dissimilar species of stimulus. Thus the diaphragm and the abdominal muscles are intended by nature to support three functions, viz. the functions of the *lungs*, of the *intestines*, and of the *bladder*. They are then instruments of relief common to these organs, whenever they are disturbed by any extraordinary irritation. Such a communication creates some alliance between them and other muscles which are not common to the three functions, but which are separately appropriated to the duty of serving one.

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* GAUBII Institut. Patholog. Medicin. 640.

† Ibid. 642.

A frequent repetition of such contractions produces the habit and facility with which these muscles, from some cause of irritation in any one of the three systems, unhappily take on excessive involuntary actions, which may influence at once the functions of respiration, digestion, and urinary excretion.

SECT. II.

The Nature of the IRRITATING CAUSE in Asthma; frequently manifest; sometimes obscure.—The CONTINUED ASTHMA of Floyer from MANIFEST IRRITATION.—Causes producing Asthma, assented to by medical Authorities from their evident Irritation.

IN some cases of excessive respiratory labour, the nature of the irritating cause may be discovered by symptoms which admit of no doubtful pathology, but in many others physicians have declared their uncertainty by resorting to conjecture and theory, which have been ingeniously built on suppositions, but which experiment has not yet supported, nor dissection ever confirmed.

The cases of manifest irritation from fixed causes are enumerated by Dr. FLOYER as one species of the Asthma, which he calls *continued*. He considers it as dependent on a primary disease, which must be removed before the Asthma will submit.

In my opinion, his causes of the continued Asthma strongly support the following proposition, that " *the excessive contractions of the muscles of* "*respiration indicate an injury or irritation in* "*some organ which those muscles serve.*"

For this reason it may be proper to take a general view of such manifest and undeniable irritations as have been observed by practical authors, before we pursue the other parts of the subject.

Hydrothorax occasions Asthma by an external compression of the air vessels of the lungs, and it is also too often the consequence of Asthma, when that disease is inveterate. Vide HALLER ad BOERHAAV. Prælect. § 102. not. 17. CAROL. PISO de Morbis ex sero, p. 217.—BAGLIVI Praxis, p. 107.—GOODWIN on animal Life and Respiration, where is an example of this cause of Asthma, artificially produced. Also BONETI Sepulcret. Anatom. tom. i. p. 515, 516, et insequent.—Mr. CRUIKSHANK on the absorbent System, p. 116, —MORGAGNI, lib. ii. epist. xvi.—LIEUTAUD, Historia Anatomico-Medica, Lib. II. *Læsiones Pectoris.* AVENBRUGGER nouvelle methode pour reconnaitre les maladies internes de la poitrine par la percussion.

Similar to this cause of Dyspnœa is the Hydrops Pericardii. MORGAGNI, lib. ii. epist. xvi. CORVISART sur les maladies du cœur.

An Empyema, abscess, or large tubercle: steatomatous tumour, &c. in the substance of the lungs or on their investing membranes.

Vide JACOB WEPFER, exerc. de apoplexia. BONETI Sepulchret. Anatom. Mangeti. tom. i. p. 352, 353, 498, 499, 500, &c.—COLUMBUS, lib. xv.—CAR. PISO de Morbis a sero, sect. iii. cap. 4.—BAILLIE's morbid Anatomy, p. 46, et inseq.

Vide TULPII observat. med. lib. ii. cap. x.—JODOCI LOMMII Medicin. Observat. lib. ii. HIPPOCRAT. lib. iv. epid. 6—4.

In the instance of a vomica there is no considerable distinction to be observed, between the manner in which nature attempts to expel it from the lungs, and her efforts in a paroxysm of spasmodic Asthma, whatever the cause of this disease may be.

T. W. has been seized with symptoms at the approach of two successive winters, that terminated each time by the rupture of a vomica, which, in the first illness, was many weeks before it broke; in the second not so long, nor was the discharge so large: in the interval he was in his usual health. In this case the difficulty of breathing had commenced after exposure to violent heat, and to the vapour of aqua fortis in refining gold; a slight cough, but interrupted and useless, attended the dyspnœa; in a few days he perceived an increase of dyspnœa, and great disorder of the stomach; then a paroxysm of laborious respiration, preventing the continuance of sleep, returned every night with the regularity of a fit of periodic Asthma, from which an ordinary observer could not in a slight view distinguish the disease, though the difference might be found by a nearer attention to collateral symptoms; the stomach was disordered with puking after food, and this affection had followed the dyspnœa; the pulse was full and hard as in other inflammations, and a pain, not pungent but oppressive, was felt where the disease lay. In the progress of the disorder the expectoration of fetid pus, in large quantity, declared the nature of the malady which irritated the lungs.

BARTHOLINE gives a very fortunate instance of the cure of a secret vomica exciting Asthma, and wearing away the body. The patient was wounded by a sword, the point of which passed between the ribs, and opened the sac. After a considerable effusion of pus, the patient was restored to health. Histor. Anat. 14. Centur. 6. Vide FERNELIUS, Patholog. lib. v. cap. x.

A brave officer was shot through the lungs at the battle of Quebec, and was cured of his wound, and an Asthma at the same time. It is probable some organic derangement was removed, as in the case related by BARTHOLINE.

Polypous concretions in the ventricles of the heart, and pulmonic vessels, are considered by HOFFMAN as a frequent occasion of difficulties of breathing. In his Consultations he appears to extend the influence of this state much farther than the general result of Asthmatic Paroxysms will justify. However, dissections have proved that this condition often prevailed, but in some instances, if not in all, it may be suspected to have been rather the consequence than the cause of Asthma. See TULPIUS, lib. i. cap. 27.—RIVERTUS, Centur. i. obs. 82.—BARTHOLIN. de Lact. Thoracic. cap. xiv.—MALPIGHIUS de polypo dissertat.—BONETUS,* tom. i. p. 128, 130, 527, 528, et inseq.—WILLIS de Affect. Hystericis et Hypochondriacis.—MORGAGNI, epist. xv. xvii. xxiv. xxvi.

Aneurismal enlargements of the heart and of the aorta; ossifications, earthy depositions and alterations of its structure, are treated of in Dr. BAILLIE's morbid Anatomy of the human Body, and in Dr. PARRY's Inquiry into the Causes, &c. of the Angina Pectoris.—MORGAGNI, epist. xv.

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* BONETUS Mangeti, Lugduni, 1700.

xvii. xxiv. xxvi.—LIEUTAUD Hist. Anat. Med. lib. ii. CORVISART: sur les maladies et les lesions du Cœur, &c.

Calculous and earthy concretions, as also bony substances, have been met with in the trachea, and in the substance of the lungs.—BAILLIE's morbid Anatomy, chap. iv.—MORGAGNI, lib. ii. epist. xv. et inseq. epist. xxiv.—DIEMERBROECK anatom. lib. ii. p. 443.—BARTHOLIN. anatom. reform. l. ii. c. ix.—KERKRINGIUS, Obs. Anat. xxvii.—BONETI Sepulch. Anatom. tom. i. p. 485, 501, 502.—FABRIC. HILDANUS, cent. ii. observ. 29.—Miscell. Curios. Anni 1671. observ. 181. In this latter instance there is the remarkable assertion that respiration was not affected. PLATERUS, Pract. lib. i. sect. 2. c. 4.—SCHENKIUS Obs. Med. rar. lib. ii.—BOERHAAVE Prælect. in Institut. § 835.—MORTON, Phthisiolog. lib. iii. cap. 6.

Bones, and other hard substances, have passed down the trachea, and created certain Asthma. TULPII Obs. lib. ii. cap. 7.

Concretions have been coughed up of different kinds, so large as to create astonishment in the relaters. KOEHLERUS* speaks of them as very

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[*] Commerc. Litter. A. 1741.

arge. **Morgagni** saw one expelled by cough as big as a peach stone. **Œthæus**[*] describes one as large as a walnut, coughed up by a girl of fourteen.

Carcinomatous tumours have been dissected from the trachea. **Bonet.** Sepulc. Anat. tom. i. p. 485.

Ossifications of the pleura, vide **Baillie**'s Morbid Anat. p. 40.

The rings of the trachea have become more or less ossified, the cartilage being converted into bone. In this case, says Dr. **Baillie**, "the mucus will not be so readily expelled by coughing, as the expirations cannot be so forcible."[†] See **Morgagni**, epist. xv.—Tumours in the trachea have been often remarked.

Fat or a tumour of the thymus gland. The thymus has been known, in some instances, not to diminish as the subject advanced in years; in others it has even increased from disease.—**Boneti** Sepulch. Anatom. tom. i. p. 486, 504.—**Baillie**'s Morbid Anatomy, p. 73.

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[*] Vide **Schenkius** ad loc. cit.

[†] Morbid Anatomy, p. 59.

Gibbosity is a well known cause of difficult respiration. This cause of irritation being permanently and rigidly fixed, either in the sternum or spine, the disease remains inveterate. Lommius[*] says, if a person becomes gibbous before puberty, in consequence of Asthma, he dies; in which he follows the prognostic of Hippocrates Aphor. 46, sect. 6, but it is highly probable that Asthma may be the consequence of the gibbosity, or at least of such an alteration of the structure of the spine or sternum, as may disturb the function of the lungs in several ways, before it be observed, and acquire the term *gibbous*. These authors have, in that case, substituted cause for effect.[†]

An ulcer in the sternum, from a removal of an excrescence, has been followed by Asthma. See HOFFMAN de Asthmate et Consult. et Resp. Med. HILDANUS Cent. 6, Obs. 74.

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[*] Jodoci Lommii Obs. Med. lib. ii. p. 140. Millar on the Asthma, p. 114. Glisson de Rachitide.

[†] The aphorism of Hippocrates creates considerable confusion in its ordinary interpretation.—Severinus (lib. de abscessibus), proposes a reading, which clears the difficulty, and makes the sense more consistent with the opinion above delivered, and with the probable meaning of Hippocrates. For ἐξ read εξω, and the passage will stand thus, ὁκόσοισι ὑϐοι ἔξω ἄσθματος, ἢ βηχος γίνονται, &c. εξω signifies *præter* as well as *extra*. The sense will then be, "qui præter anhelationem et tussim gibbi quoque fiunt, eos ante pubertatem mori." See Bonet. de Gibbositate.

Adhesions of the lungs to the diaphragm, pleura, and pericardium, have been frequently found by dissection; these are consequent to inflammation, and it is obvious that Asthma may attend this organic alteration.—BONETUS, tom. i. p. 509, 512.—BONTIUS, Med. Indor. Observ. vii.—WILLIS Pharm. Rat. part ii. sect. 1, c. 8.—HIPPOCRAT. lib. ii. de morbis pulmon. &c. MORGAGNI, epist. xvi.

These adhesions are said, by DIEMEBROECK, to be found in one-third of the subjects opened. TULPIUS affirms that the lungs, in very few bodies, are entirely free from such appearances. LIEUTAUD has a large collection of such facts.

The straining of the lungs, by running, is mentioned by FLOYER, by which injury may happen to the membranes or fibres in the interstices of the air cells.

Flatus in the colon and stomach are seldom absent in the spasmodic Asthma, and if such a state of these viscera be attended with continued dyspnœa, the disease may still be accounted a variety of the other species, in which it will appear that the periods of intermission are very uncertain, and sometimes lost in the advanced stages of the complaint, or when it is complicated.

Tumours of the lower viscera, schirrous, hydropic, steatomatous, or flatulent, produce Asthma by exciting an excessive action of the thoracic and abdominal muscles, intended to assist the functions which these tumours distress. Instances are numerous, in practical authors, of the inconvenience created by such causes. Bree on Splenitis. Medic. Chirurg. Transactions, vol. ii. 3.

Fat in the abdomen, and loading the omentum and other viscera, is a cause of dyspnœa very frequently discovered.

The gravid uterus is a very general occasion of dyspnœa. Ascites and tympanites produce the same effect. Dr. Ferrier* gives a curious instance of tympanites, in which the omentum was found lying in a sac formed in the diaphragm, on the right side of the thorax; Asthma was an inevitable effect symptomatic of such a situation of the viscera.

Fat and steatomatous tumours have adhered to the diaphragm.—Vide VESLINGIUS Syntagma Anat. cap, 9.—KERKRINGIUS Obs. Anatom. 89.

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* Med. Hist. and Reflect. vol. i. p. 41.

Tumours of this kind have also adhered to the pleura and mediastinum. BONETI, tom. i. p. 533, et inseq.

The liver has been found of an enormous size by many practitioners. BONET. tom. i. p. 537, et inseq. Asthma is very frequently symptomatic of the diseases of this viscus. Enlargement of the spleen, and a slow inflammation of this organ, also occasion Asthma. BREE on Splenitis. Medico Chirurg. Transactions, vols. ii. iii.

The diseases of the mesentery and omentum, especially if they give occasion to an altered state of the liver and stomach, are causes of Asthma. JOH. RHODIUS, Cent. 2. Obser. 25.—GUERN. ROLFINKIUS, Dissert. Anat. lib. i. cap. 13.

The liver has been united, by adhesion, to the diaphragm and lungs. DIEMERBROECK, Anat. lib. i. c. 13.

An hydropic patient was opened, and the liver was found to contain a large sac of hydatids, which was connected, by adhesion, to the ductus communis; for some time before this person swelled in the abdomen, he had been asthmatic, and the bile had not passed regularly into the duodenum. Flatulence of the stomach was predominant, and the disease was attended by most of the symptoms of spasmodic Asthma.

Worms have been found, by anatomists, in different situations, in this viscus.—LIEUTAUD Hist. Anatom. Med. lib. i. 193.

The absorbent glands, in the posterior mediastinum, are subject to enlargement from scrofula. When this affection is considerable, it necessarily produces difficulty of breathing, by pressure on the lungs and trachea.* The same glands near the trachea are occasionally converted into bony or earthy matter, and press the passage.†

DIEMERBROECK‡ relates, that he saw a live worm coughed up from the lungs of a woman; and that he had observed these animals, by dissection, in the vesiculæ of the lungs. He infers, that they must have been bred in these cells, for if they had inhabited the bronchia, suffocation would have been the consequence, and the most violent cough and Asthma. If they had been inhabitants of the cells at the extremities of the bronchia, it must be believed that Asthma would have been equally inevitable, though, perhaps, not so acute.

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* BAILLIE's morbid Anatomy, p. 71.

† BAILLIE's morbid Anatomy, p. 72.

‡ Lib. ii. p. 442.

Asthma has certainly proceeded from hydatids in the substance of the lungs, on the pleura, diaphragm, and even on the surface of the heart. The sudden rupture of these hydatids has produced immediate suffocation. Vide OTTONEM HEURNIUM obs. 18—BARTHOLINUM, Cent. ii. obs. 61.—CAR. PISO de morbis a sero, sect. 3. cap. 7.—BONETI Sepulchret. Anat. tom. i. p. 498, 499.

For a curious case of the dilatation of the lower part of the pharynx, by which a pouch was gradually formed, stopping the passage of the œsophagus, see Med. Observat. vol. 3. p. 85.

The sternum and the cartilaginous ends of the ribs have become osseous, and not under the controul of the muscles of inspiration. BONET. tom. i. p. 533, and PLATERUS Praxis, lib. i. cap. 4. Here is a case of Asthma analogous to any other form of gibbosity.

The malformation of the ensiforme cartilage, by its being turned inwards as if artificially depressed, is productive of hepatitis and chronic affections of the stomach, and also of Asthma. DIEMERBROECK has particularly noticed the inconveniences from this cause. Lib. ix. cap. xiv.

BARTHOLINE alleges the effusion of chyle to be a cause of asthmatic affection. In this case he supposes the rupture of a duct. Vide Specileg. 2 de Vasis Lymph. cap. 2.

An extreme dryness of the parenchyma of the lungs has been well ascertained. RHODIUS [*] asserts that it has been occasioned by the profuse use of the decoction of guaiacum wood. AVICENNA had remarked such a condition to arise from the hot vapour of furnaces and metallic fusions.

HEURNIUS [†] saw the lungs of a printer so altered as to appear almost like a dried apple.

Considerable deficiencies of substance have been discovered by dissection in the pulmonary system. Vide SENAC Traité du Cœur, l. iv. c. 3.—HALLER, Opuscul. Patholog. Obs. 17.

The mediastinum, and even the diaphragm with a large portion of the lungs, have been wanting. DIEMERBROECK Anatom. l. i. c. 13. This defect was imperfectly supplied by the adhesion of the liver to the only lobe of the lungs which appeared, and the subject arrived at his seventh year.

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[*] Cent. 2. Obs. xxi.

[†] De Morb. Pectoris, cap. iv.

The account of the dissection of this subject communicated by the physician, D. WASSENAER, to DIEMERBROECK himself, would have been more satisfactory if the natural history of the boy had been more particularly detailed. We are only told that he was asthmatic all his life, and harassed by violent and frequent cough from the slightest causes; a slow fever at length terminated his sufferings.

The conformation of this subject was not less curious than that of the celebrated blue boy, whose case is given by Dr. SANDIFORT.* Here the aorta arose from the right ventricle as well as from the left; the pulmonary artery was scarcely pervious to a small probe, and the difficulty of passing it from the heart to the lungs was greater than in the contrary direction. This patient was asthmatical from the second year of his life, which was extended, in a miserable series of sufferings, to twelve years and a few months.

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* Vide Observat. Anatomico-Patholog. Lugd. Batav. 1777, p. 11, also the Remarks of Dr. BEDDOES. Observat. on Calculus, &c. p. 63, et inseq.

The circulation through the lungs being impeded by any organic malformation, must be productive of Asthma; and it appears that if the current be diverted from the course of pulmonary circulation, the same effect, in a greater or less degree, must happen. HALLER says, that the arterious duct is found pervious in the second year, and the foramen ovale has been open longer by his observation. Tom. iii. 161, 162.

BARTHOLINE observed the *foramen ovale* open in *adults* more than once. Anatom. Reformat. lib. li. cap. 8.

MORGAGNI relates the history of a virgin subject who attained her sixteenth year. She had been sickly from her birth, and affected with extreme weakness; her respiration was difficult, and her whole skin of a livid colour. The foramen ovale was found so wide as to admit the little finger. De Causis, &c. epist. xvi.

In these instances the blood cannot be exposed to the chemical influence of the inspired air.—The heart cannot, therefore, be sufficiently stimulated, and the black blood in its cavities will cause anxiety, and irritate the muscles of respiration.

Miners are said, by SENNERTUS, to have been opened, in whose lungs metals were found of the kind in which their operations lay. HORSTIUS confirms the bad effects said to proceed from the metallic fumes to which artists are exposed, but fancifully asserts, that such complaints are only to be remedied by mineral medicines. See SENNERTI Pract. lib. ii. p. 2. cap. 2.—BARTHOLIN. Cent. 4. cum THEOD. SCHENKIUS, epis. 72.

Stone-cutters and cleaners of feathers are liable to receive the matter which is suspended in the air into their lungs, and to become asthmatic. DIEMERBROECK, lib. ii. p. 443.

According to SYLVIUS, the parenchyma of the lungs is sometimes dense and corrugated, occasioning dyspnœa. He attributes this state to the restringent quality of the blood, but it may be assigned perhaps, with more reason, to preceding inflammation. SYLVIUS de la Boe, Praxis, lib. i. cap. 22. § 17, 18.

HOFFMAN describes the pulmonary vesicles in this disease, "Quasi carnea, crassa, rubicunda, "substantia infarctas."

MORGAGNI* says, the matter filling the lungs is like the substance of the liver, and SENAC[*] confirms this description.

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* De SEDIBUS, &c. epist. xxi.

Dr. BAILLIE adds his testimony to the fact. He says, "The substance of the lungs has in this "disease nearly the same solidity, and the same "general appearance as the liver. When examined more minutely, the air cells appear to be "filled with a brownish solid matter."[†]

Flatus have been said to distend the lungs, being carried there by the lacteals, &c. See Reg. de Graaf de Succo Pancreatico, cap. 9, and also FLOYER passim. A nobleman, says RODIUS,[‡] died of a diarrhœa cum suspirio. The lungs were so swelled with wind as to fill the whole cavity of the breast.

SYLVIUS[§] assures us that flatus make their way every-where. And Mr. J. HUNTER[||] coincides in his opinion, as we may presume from his account of the explosions from the vagina. Notwithstanding these authorities, it may perhaps be most

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[*] Traité du Cœur, l. iv. ch. 3.

[†] Morbid Anatomy, p. 52.

[‡] Observat. xxii. Cent. ii.

[§] Lib. ii. cap. 21. § 19.

[||] See Animal Œconomy. The phænomenon asserted by the prudent to believe, that the blood contains no detached masses of air.

The lungs are susceptible of a diseased growth, of which instances are well ascertained.*

On opening the thorax of an hydropic patient, his lungs were found of a monstrous size, very pale, and free from any other disease. The heart was, however, loaded with excessive fat; and these organs seemed to have robbed the liver of its nourishment, for that viscus was particularly small. The patient had laboured under dyspnœa for many years.

The suppression of customary evacuations of blood, as the menstrual or hæmorrhoidal flux; by which the lungs are necessarily oppressed with the redundant fluid. See Floyer, p. 96.—Hoffman Consult. and Respond. Cent. i.—The difficulty of breathing, from this cause, is more entitled to the

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ingenious anatomist is very plainly described by Sylvius (loc. citat.) Flatus.—" Observantur quoque excludi per Urethram; " sic qui ad Uterum sunt delati, aut in ipso geniti per ipsius " cervicem utramque observantur erumpere, atque foras exitum " invenire!"

* Sylvius' Praxis, lib. i. cap. 24, sect. 12.

name of dyspnœa, and may precede either Asthma or Phthisis. Vid. Schneiderus de catarrh. lib. iii. c. 6.

Exanthemata repelled are a cause of Asthma, assented to by most practitioners; there is no difficulty in supposing that the matter of those herpetic eruptions, which were manifest to the senses when seated on the external skin, may be deposited on the lungs or their investing membranes, when the external disease has suddenly disappeared. The same observation applies to other eruptions, whether attended by pyrexia or not. Phthisis follows their repulsion as well as Asthma. See Floyer, p. 100.

An instance of relief from the eruption of small tumours which appeared externally, is recorded by Dr. STARK. Clin. et Anatom. Observ. p. 44.

Similar to this cause of Asthma, the gout atonic or retrocedent may create that affection, and frequently does. See HOFFMAN de Asthmate et Consult. et Resp. Med. Cent. 1.

A viscid mucus secreted by the glands of the trachea and bronchia, and loading their follicles, necessarily impedes the free admission of air, and irritates the organ. This species of Asthma approaches to the character of periodic convulsive Asthma, but as depending on a cause which is sufficiently manifest to have received the assent of medical observers, it is classed with other cases of the continued or symptomatic Asthma of FLOYER, or Dyspnœa of CULLEN. The latter writer called it Dyspnœa Catarrhalis, and HOFFMAN Asthma Pituitosum. Vid. tom. iii. sect. ii. cap. ii. § 3. Also WILLIS Pharm. Rat. p. 2. sect. i. cap. 12.

Polypi of tenacious matter have been the occasion of asthma, when the air vessels were filled with this substance. Secretions of this kind induced some writers to speak of vascular tubes being discharged, but the case has been explained with great distinctness by Dr. WARREN in the first volume of Transactions of the College of Physicians. Art. xvi. of the Bronchial Polypus.

A more particular account may be obtained of derangements of the thoracic and abdominal viscera, leading to, or inducing, difficulties of breathing, by consulting Morgagni, Bonetus, and Lieutand.

There are also numerous detached facts in the different journals, foreign and domestic, which support the same conclusion.

It has been generally concluded, that these causes induced Asthma by obstructing the action of the lungs or diaphragm.

They must, however, be considered as causes of *irritation* exciting the respiratory muscles to relieve the organs in which they were seated.

SECT. III.

Dyspnœa of Dr. Cullen comprizes cases of continued Asthma of Floyer.—Under this name the disease preserves its character in a milder form.—Anhelation an acute case of Dyspnœa, proceeding from violent or rapid exercise.—The muscles of locomotion and respiration do not readily increase their actions at the same time.

DR. CULLEN closely follows Sir J. Floyer in the idiopathic species of Asthma, but he appears to desert him in his *continued species* of symptomatic Asthma, as he excludes most of the cases of this species from the genus Asthma, and places them with many others, under the genus Dyspnœa:* but this is merely giving a new name to an old disease, whilst the symptoms remain essentially the same.

As dyspnœa is still the effect of some obstruction, Nosologists appear to make the cause of this affection obvious, by distinguishing its varieties by a trivial addition.

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* Nosol. Method. G. iv. and L. vi.

Whenever there is a difficulty of breathing there is an excess of respiratory actions occasioned by irritation existing in certain degrees of force, which cannot always be ascertained except from their effect; still we must not forget that "Majus aut "minus non variat speciem."

It may be proper to remark here that the cause is at present supposed to be applied to a habit in which the standard of nervous sensibility is moderate and common to subjects not advanced far in the disease. We shall afterwards see that accumulated irritability produces, or is attended by, increased sensibility to stimuli; and that habits of morbid contractions of muscles are a disorder when the primary irritation is removed.

Dyspnœa is considered by HOFFMAN as being transitory and without danger.* It attends commonly on the corpulent, fat and plethoric, who feel it most when the body is put in motion.

In such subjects the structure of the lungs being lax, and the contractions of the pulmonary artery weak, the blood passes with considerable difficulty to the left side of the heart, occasioning a compression of the air vessels. All the viscera of the chest in such patients have been found preternaturally loaded with fat, and the cases of many of them have been referred to a disease of the heart.*

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* Opera tom. 3. Sect. 3. cap. 2. § 3. Willis Pharm. Rat. Part II. Sect. 1. cap. 2.

If in this state the circulation be hurried by some accidental cause, the accumulation of blood in the pulmonary vessels will be intolerable, yet as they are not thin and tender, but dilatable, rupture may not take place.

It has already been stated that suppressions of customary evacuations of blood, materially lead to this condition of the vessels of the lungs.

That suffocative sensation which is brought on by rapid exercise is a more acute case of Dyspnœa, called by nosologists *Anhelation*. Its immediate cause is similar, though the remote ones had not been applied.

When a person is said to be "*out of breath*" from violent exertion, the blood has been accelerated from all parts of the body to the heart; that organ is stimulated to discharge it through the lungs to its left side, and its contractions are quick in proportion to the frequency with which this stimulus is renewed. Inspirations of air are then eagerly attempted to be made, but the exertions of the locomotive muscles seem to check those of the muscles of inspiration; and to prevent the respirations being increased in the customary proportion to the pulsations of the heart and arteries. If 70 pulsations be usually accompanied by 18 respirations, 140 pulsations should be attended by 36 respirations, but it is certain that these relative proportions are not supported in continued and violent exercises.

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* See Dr. Parry's Cases of Syncope Anginosa.

When the action of the locomotive muscles is suspended, that of the respiratory muscles is increased, and the blood being more readily passed through the lungs, because the organ is more perfectly expanded, a sense of suffocative irritation is removed.

HALLER points out the sense of this irritation as the efficient cause of the whole process of respiration in a moderate and natural degree, but if a feeling of suffocation originally excited the act of breathing, and if that function continue to be supported through the habitual, and, therefore, imperceptible operation of the same cause, the extreme case of too violent a repletion of the vessels may be well supposed to excite a proportionate action of the respiratory muscles for the same end.

This distress from violent exercise is, however, most oppressive to those who have not been in the practice of it, for habit will not only enable a person to use his locomotive muscles with greater facility and vigour, but to accompany their exertion with more respiratory action. From habits of regular exercise the vessels will therefore be less subject to partial dilatation, and the fluids contained in them will be more equally distributed through the superficial capillaries of the body. But practice will not entirely overcome the influence, or prevent the consequence of some extraordinary irritation from this cause.

SECT. IV.

THE FIRST SPECIES OF CONVULSIVE ASTHMA FROM THE IRRITATION OF EFFUSED SERUM IN THE LUNGS.

The progress made in this Inquiry.—Asthma from IRRITATION not so apparent as in the continued species.—The PERIODIC FLATULENT of Floyer; the SPASMODIC ASTHMA of Cullen. —The disease described.—Its proximate cause investigated.— The path which was followed in the Inquiry into the cause of the continued species pursued in treating of this.—Symptoms and indications generally the same.—Sir John Floyer's case.

IT has been shewn that violent contractions of the respiratory muscles may be excited by the irritation of an organ, whose functions these muscles are intended to assist.

This disorder of respiration has even been traced both in Dyspnœa and Asthma to a material cause which could not fail, by its offending properties, to occasion it. In many instances where the effort to eject this material had been successful, the labour of respiration has ceased, nor would it ever continue after such cause was removed, but from secondary effects which may be referred to the laws of muscular association and habit, or to the alteration of structure which the disease may have occasioned in the organ originally affected.

But there is a distinction made by * Sir JOHN FLOYER which separates the affection occasioned by a manifest inherent cause, from that of which the cause is not so obvious. The latter he calls "the Periodic flatulent Asthma." † WILLIS terms it "Asthma Convulsivum." ‡ HOFFMAN and § CULLEN, Convulsivum et Spasmodico-flatulentum, or, Spasmodic Asthma.

The last author places three idiopathic species under this genus, of which the first is *spontaneous* "sine causa manifesta vel alio morbo comitante."

The second is *Asthma Exanthematicum*, which may be properly classed with other cases already noticed under the Dyspnœa of CULLEN, and the Continued Species of FLOYER.

The third is *Asthma Plethoricum*, arising from a suppression of usual evacuations of blood, or from a spontáneous plethora. It is true that such a state of the pulmonary vessels may exist as, by compressing the vesiculæ and bronchia, may prevent their perfect expansion, but I have preferred calling such affection Dyspnœa, because, unless it produce effusion of serum from the exhalents, or be attended in its progress by some new organic irritation, it does not periodically excite the convulsive paroxysm.

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* Floyer, chap. 1.

† Willis Pharm. Rat. p. ii. sect. i. cap. 12.

‡ Hoffman, iii. 94.

§ Nosolog. Method. G. lv. Practice of Physic, MCCCLXXIII.

THE attack of a paroxysm of *Periodic or Convulsive Asthma* is preceded very generally by Dyspepsia, and the circumstances which occur to a relaxed habit. This condition of the body may have prevailed for months or years before it takes the additional form of Asthma, but when that disease appears, Dyspepsia never fails to be aggravated, and to shew itself with violence before the fit.

The first symptoms are flatulence and distension of the stomach and bowels; a heavy pain over the forehead and eyes; eructation of wind, with water which is sometimes insipid, at others sour. When the evening approaches, this weight over the eyes becomes more oppressive, and the patient is very sleepy. Occasionally, if he be particularly animated by company and conversation, the drowsiness does not take place, but a shortness of breathing is perceived, and soon after much anxiety of the præcordia, with great restlessness. The presence of company then becomes irksome, as it seems to increase a certain heat of the body, a want of free respiration, and an irritability which repels the most cautious attentions of friends. Frequently at this period there is a tingling and heat in the ears, neck, and breast, and a motion to expel the contents of the bowels is attempted with some violence, and with great uneasiness of the abdominal muscles. When an asthmatic feels these warnings, he may be convinced that his enemy is at hand.

At some uncertain hour before midnight the patient becomes suddenly sensible of the increased violence of the disorder; most frequently after a slumber in bed he awakes with great difficulty of breathing, and he feels the necessity of a more erect posture of his body. Inspiration is performed with great effort of the muscles, but is never perfectly deep, and the diaphragm seems to descend with great difficulty against an opposing force.

There is now a desire of free air, speaking becomes distressing, and the irritability of the mind continues, but is not so acute as in the approach of the fit. There is a great straitness of the chest, and a wheezing sound in respiration. An inclination to cough shews itself, but this is small and interrupted. The pulse is increased in quickness a few strokes, but without hardness. There is no preternatural thirst, unless, as often happens, the fit be excited by indigestible matter in the first passages. There is a propensity to make water, which is copious and pale, and frequently discharged.

After some hours of distress the patient perceives his anxiety to be less, the breathing is less quick and laborious, the inspirations are longer and more full, the expirations are still attended with wheezing; the pulse is not so quick, but more full; irritation is less acute. The cough probably brings up a portion of phlegm, and a very sensible relief follows that excretion. Then the tranquil state of the feelings introduces sleep, but not unaccompanied by wheezing, which continues almost always through the first night, and until, by the progress of the fit on the second or third day, a more considerable expectoration of mucus takes place.

The second day is ushered in by a remission of the symptoms which the patient perceives from the time of awaking in the morning. No change of posture is, however, yet made with impunity, and particular distress affects him, if he engage in the fatigue of dressing, whilst the stomach is empty. The pulse will be accelerated more than it was in the acmé of the paroxysm, and motion must frequently be suspended, or a vehement agony for breath will certainly come on. During the day, if no particular hurry occur, the breathing becomes gradually more free till the evening; an inexperienced asthmatic even flatters himself that his disease is leaving him, but he finds at the approach of night that he must sustain a new attack. The paroxysm recommences with the usual symptoms, and the night is passed nearly as the former; but the sleep is more perfect, and productive of more relief.

The third day, the remission is more complete; there is some additional expectoration, and bodily motion is performed with less distress, but still with great inconvenience. After the paroxysm has been renewed in this manner for three nights, the expectoration generally becomes free, but there is no certain termination of the fit at a fixed period. However, except in particular cases, it goes off after a few days; and as the daily remissions become more perfect, the urine is higher coloured, and in smaller quantities; the expectorated mucus is more copious and digested, strength of pulse and vigour of action increase, and good humour again enlivens the mind.

The expectorated mucus has been said to be streaked with black, or to have a blackish tinge, and this appearance certainly prevails in many instances, but not invariably. The taste of the expectorated mucus is also equally uncertain; it is sometimes sweetish, but more frequently it is saline, and it is occasiónally coloured minutely with blood.

There is a considerable variation in the periods of the accession of the paroxysm, and in its duration, in the intervals of the fits, the quantity of mucus expectorated, and the freedom of that discharge. These circumstances of the disease will be influenced by the predisposing causes and occasional accidents.

The disease appears to invade all temperaments; but, I believe, more particularly the melancholic, or that which is between the melancholic and sanguine. The sanguine being in fact more liable to fall into phthisis.

This description seems to apply to the convulsive Asthma of Professor Cullen. I wish it to be received as that of the *First Species* of this Inquiry, which the Author suffered in his own person for many years.

IN examining the symptoms of a paroxysm of this disease, we find some uniform and constant, and others generally occurring, but with uncertainty, in proportion to the variety and the influence of remote causes.

The symptoms which are sufficiently constant to distinguish the disease, are described by Dr. CULLEN in his Nosology.

"A difficulty of breathing coming on at intervals.

"A sense of straitness in the chest.

"A wheezing in respiration.

"Cough in the beginning of the fit, difficult or none; towards the end free, and attended with expectoration, which is often copious.*"

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* Asthma. Spirandi difficultas per intervalla subiens; cum angustiæ in pectore sensu, et respiratione cum sibilo strepente; tussis sub initio paroxysmi difficilis, vel nulla, versus finem libera, cum sputo muci sæpe copioso. *Nosolog. Method. G. LV.*

In endeavouring to discover the cause of these symptoms, I shall pursue the steps which have before led me to the source of similar appearances, as I expect from this course of inquiry to find a cause equal in its properties of acrimony or bulk, by which the respiratory muscles are irritated into an excess of action.

In those disorders a material was discharged, or a compressing force was removed, before the extraordinary contraction of the muscles was mitigated, or finally made to subside. In some cases a mechanical inconvenience, as in the instance of a gibbous spine, could not be removed, and then the irritating cause remaining, the disorder of respiration did not cease.

In such circumstances the indications were natural, and consistent with the laws which govern the animal economy*. They would have afforded evidence that nature was making an exertion to discharge something injurious, even if it had not been exposed to the senses.

Having ascertained these outlines and signals of direction, we are encouraged to follow the path in which nature is our guide; and we may expect from the acknowledged simplicity and uniformity of her laws, that the same principle of *irritation* may have excited her efforts in other cases of Asthma, though it may be more retired from our view, or wear a different, or a more subtle form, than we had observed in the instances before recited.

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* See Sect. I.

It appears, then, that the same efforts of the muscles of respiration are exerted in this First Species of Asthma, as in the Continued Species, and that in general a longer continuance of too much action of those muscles is the only distinction to be perceived between the latter species of FLOYER, and the periodic or convulsive Asthma of CULLEN. The inference, therefore, that similar effects proceeded from similar causes, being less dependant on hypothesis, may be a more satisfactory and safe guide to success in practice.

The permanence of the symptoms in one species was accounted for, and their suspension in the other might have been satisfactorily explained if certain functions of the animal system had been duly considered; since these furnished a means of removing the particular cause of irritation, from which the Periodic, as well as the Continued Asthma, appeared to proceed.

We cannot properly trace appearances in the animal body without referring to the laws of the œconomy of life, any more than the general philosopher can take a latitude independent of immutable principles in reasoning on the natural objects of his inquiries.

Sir J. FLOYER, describing the *Periodic Asthma*, says, " the diaphragm is not without much diffi-" culty moved downwards ; but for enlarging " the breast in inspiration, the intercostal muscles " which serve for the raising of the ribs, and " lifting up the breast, strive and labour more " vehemently ; and the scapular and lumbar " muscles which serve for strong inspiration, join " all their force, and strain themselves to lift up " the breast and shoulders, for enlarging the cavity " of the breast, that the lungs may have a place " sufficient for their expansion, and the air more " plentifully inspire.*"

Here is sufficient evidence of distress in labouring to accomplish some object, and it is surprising that FLOYER, who had personal experience of the disease for thirty years, had not yet considered it as the energy of nature exerted to remove an injury. We may perhaps be justified in believing that he was influenced by a prevailing theory, and that from his not observing in some very few instances of the disorder a discharge of mucus or of any other extraneous matter, he was discouraged from following to their source symptoms which uniformly attended the progress of general cases. If in addition to this consideration we reflect upon the small advance which had been yet made in the knowledge of the lymphatic system, whose absorbing power is exerted with such effect in the removal of serous effusion from every cavity of the body, we may reasonably account for his neglect of causes exciting this disorder of the muscles.

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* Floyer on the Asthma, p. 7.

Physiologists have since attributed such occasional increase of exertion to some obstacle interrupting the freedom of respiration. In those cases, says HALLER, the muscles inserted into the thorax, clavicles, and scapulæ, unite their force. "Scaleni musculi, mastoidei, trapezii, pectorales, "tum levatores, parvi, quos ex anatome oportet "repetere.*"

That the absorbent vessels are equally excited

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[*] Pr. Lin. Phisiolog. CCLXIV.

when the lungs are threatened with suffocation, appears from the observation of Mr. CRUIKSHANK.*
"I have repeatedly seen in animals dying of
"hæmoptoe, and in the human subject itself, the
"lymphatics of the lungs, which at other times
"contain a transparent fluid, turgid with blood,
"which they had absorbed from the air cells." It seems to be a necessary conclusion, that the same lymphatics, which act with certain energy when the air cells of the lungs require to be cleared from blood, will also act with equal power if the cells are oppressed with lymph.

Muscular motions performed with unusual energy are therefore strong indications of some injury to be averted, or some offence to be removed. And, as in the Periodic Asthma, the cause is not so clear as in the Continued Species, I shall take advantage of these indications, as the best direction which an obscure disease affords.

These indications seem in the first place to point out a cause of *irritation* in the lungs; or, in the next place, a cause of irritation in some of the abdominal viscera, since these in common with the lungs, are aided in their functions by the action of the respiratory muscles.

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* On the Absorbent Vessels, p. 42.

As it appears also from the preceding sections, that such irritation may be *material*, we should consider, if any excretion of matter favour this supposition, or if any actual cause of offence manifestly accompany the disease, and disappear when it subsides; or, being only occasionally absent, if its absence can be accounted for by any certain or acknowledged laws of the animal œcomomy.

SECT. V.

The presence of mucus in Asthma.—The origin of this serous fluid.—The observations of writers on this symptom of the disease.—The earliest medical authorities.—Galen.—Alexander Trallianus.—The Arabian Physicians.—Remark of Willis, and criticism of Morgagni on the opinions of the ancient authors.—Medical writers of the 16th and 17th centuries.—Jodocus Lommius.—Sennertus—Riverius—all acknowledged an excess of serum in Asthma, and made it a cause of the disease.—The doctrine of Willis founded on this condition of the fluids.—Considerations on the authority of Willis.

The spitting of mucus is so general a symptom of convulsive Asthma, that this matter must have been considered the principal cause of the disease by modern physicians, but from the objection that some cases had occurred, in which there was no expectoration; whilst in others it was not considered equal to the effect produced; these instances of Asthma have, however, been uncommon, and might have proceeded from the same proximate cause embodied in a more subtle form, as in the

Second Species of this Inquiry; or the lymph might have been carried off by the absorbents, if such irritating matter existed in the lungs, as in this First Species. But the presence of mucus is a conspicuous part of the disease in general, since it is partially expelled from the bronchia as the paroxysm declines, and copiously, in most cases, at the termination.

This matter is separated upon the membranes of all the cavities of the body.* Where those cavities have external openings it is not coagulable by heat, but where there are no external openings it is coagulable in the heat of boiling water.

Its quantity, in general, will be found to be regulated by the vigour of the animal, because the power of absorption bears a relative proportion to his strength or weakness.

An acute physiologist makes the following distinction: "In diseases where the contraction of

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* Oῤῤὸς serum and lymph are not proved to be different from mucus, and distinctions can only be taken according to the consistence of the fluid. They are equally the watery part of the blood, combining albumen and jelly, separated in a condition more or less morbid.

“ the vessels is too great, there is scarcely as much
“ moisture in the cavities or interstices of the
“ parts as allow them to slide easily upon one ano-
“ ther. In health the quanity of such liquors is
“ moderate, and a pretty constant equality is kept
“ up between the action of the exhalents and
“ absorbents; but when the body turns weak the
“ exhalents pour out so much more than the
“ absorbents can take in, that all the cavities are
“ found to contain considerable quantities of
“ liquors.”*

In attributing one species of Asthma, in which is included so large a proportion of cases, to the influence of this irritating cause, the authority of former writers may be naturally consulted; but here we must be careful to limit our confidence in their evidence to the history of appearances, excluding from our minds the possible influence of prevailing theories, and of any aversion we may entertain for those which are exploded. The former may not consist with the testimony of facts, and the latter ought not to involve in their disgrace the record of those facts which experience has rather established than opposed.

It may be unnecessary to examine *all* the old writers for their opinions of Asthma, but let us consider the testimonies of some few who had weight in the periods when they flourished.

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* Alex. Monro, sen. Works, p. 377.

From these we may fairly infer what would be produced by a more extended investigation; in fact, the contemporary writers, and those who followed them, entirely coincide with their brethren, and as far as I have been able to pursue the inquiry, no variety of description is to be discovered.

GALEN makes two causes only of Asthma, each distinguished by a material producing irritation, viz. thick and pituitous humours, and a crude tubercle in the lungs.

ALEXANDER TRALLIANUS does not expressly mention Asthma by name, but doubtless alludes to that affection when he treats of the "signs of "viscid humours contained in the lungs." Viscid serum, and extraneous substances, were the only recorded causes of Asthma at this period of medical observation; nor is any alteration to be expected during the interval of many centuries.

At length the Arabian adopted the pathology of the Greek physicians, with some addition, but little or no rejection of their facts: in Asthma their doctrine was accepted without dispute; and remedies were directed to incide, dry up, expectorate, divert, and purge off serous humour in the lungs. AVICENNA gives the caution of not using the most powerful diuretics, lest the thinner fluid should be discharged, and the thick remain behind.

This practical direction resulted from the respect which the Arabian physician paid to the doctrines which he received from Greece. Pituita was supposed to take a consistence according to the situation in which it was included after it had descended from the head. At first it was watery and thin: then mucous as it was thickened by warmth; when the mucous distillation was shut up in a cold part of the body, it became vitreous; and in this state would create excessive pain if transferred to a hot situation: it was lastly gypseous, or stony, when included in the lungs, kidneys, or joints; because here the humour being resolved, and the thinner parts carried off, the thickest hardened into a calculous substance.

When such were the only causes clearly assigned by the ancient writers for the production of Asthma, WILLIS might justly remark, that they were not aware of a purely convulsive affection in considering the general character of that disease.

MORGAGNI,* by his criticism, has not invalidated the assertion of WILLIS; for though the nerves may be sometimes particularly affected, in the opinion of those authors, the impression upon them is caused by the defluxion of serum, or pituitous matter, or its supposed origin, the vapours from the lower viscera. It is a very strong proof of the infrequency of Asthma, without the manifest irritation of such causes, when the existence of more obscure causes is a subject of debate.

The Arabian writers were themselves copied, with servile dependence, till the sixteenth, and even the seventeenth century, when the diffusion of anatomical knowledge, and a zeal for experiment, gave a more clear discernment of causes and effects, and a more just reasoning on their mutual relation. We shall therefore offer some opinions that prevailed respecting Asthma at those periods; and particularly the opinion of WILLIS, who has given so remarkable a tone to the teachers who followed him, that his authority on this disease may be traced through HOFFMAN, FLOYER, and CULLEN, who, however, appear to have had a very imperfect comprehension of his principles and meaning.

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* Liber ii. Epist. xv.

Jodocus Lommius* gives the signs of this disease under the term Anhelatio. He attributes it to a concreted phlegm, and even to stones in the lungs; and he closely adheres to the antients in neglecting other causes.

Sennertus † delivers a pathology which entirely depends on the evident irritation of extraneous substances described in the first part of this Inquiry: or, secondly, on the serous humour which general observation had established as the predominant symptom of Asthma. He informs us, that the proximate cause of Asthma is the straitening of the bronchial tubes from compression or obstruction of humours often thick and viscid; sometimes thin and serous, but copious in quantity.

The hereditary disposition to Asthma is also stated to consist in a certain laxity and weakness of the lungs, by which the organ is frequently more liable to receive a flux of humours, and to permit their accumulation. In the prognostic, he says, other symptoms besides those of the pulse and respiration, must be attended to; for these may deceive the physician. Some patients die suddenly by suffocation, with a good pulse, whilst others, having a bad pulsation, are quickly restored by the dispersion of flatus, or *the discharge of serous humour.*

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* Observat. Medicinal. Liber Secundus, p. 110, necnon, p. 115 & seq.

† Tom. ii. lib. ii. Part III. cap. 2.

According to RIVERIUS,* though the generic term Asthma take in all difficulties of breathing, it more particularly points out that disorder of respiration which arises from the infarction of the bronchia, in its proper character, without fever, though sometimes fever may attend. The divisions of Asthma, are into Dyspnœa, Asthma, and Orthopnœa. The Dyspnœa is inferior in degree to Asthma and Orthopnœa, being the effect of a less quantity of matter obstructing the lungs; it is therefore without wheezing. Asthma is then described with this attendant symptom: for, says the writer, in Asthma, properly so called, the bronchia, are filled with a pituitous humour, which, meeting the air in respiration, occasions the sound called wheezing. Orthopnœa is the extreme degree of this disorder of respiration.

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* Vide Praxeos Medicæ, lib. vii. cap. 1.

By these examples we may see, that in this period of medicine, an excess of serum was a permanent feature in the character of Asthma; and that, if a flux from the head were occasionally superseded, a flow of this matter from the pulmonary vessels took its place in the prevailing doctrines.

Cases of Asthma, so purely convulsive as to be independent of serous defluxion, must have been extremely rare; for they are not acknowledged as a species, nor ever clearly excepted from the general account.

However tedious it may therefore be to inquire into the histories of the antient writers, the examination of them must be useful, if it lead to this conclusive inference, that no such disease as Convulsive Asthma, *without a manifest cause*, was observed from the earliest records of medicine, till the time of CULLEN, who has, however, denied to the majority of cases, the existence of such cause.

WILLIS admits the Asthmatic affection to be free from an organic fault in the lungs in some instances, but he does not exempt these, though termed purely spasmodic, from the exciting influence of abundant serum. The procatarxis is, in his language, a redundance of such humours in the mass of blood, and in the whole body: * "cujus "materiæ portio quædam, arteriarum osculis in "pulmones exudans, tussim ordinariam creat; "postea cum serosa colluvies adhuc in sanguine "exuberans, et particulis spasmodicis referta, "etiam intra caput aggereretur, eadem nervos "pneumonicos subiens, tussim simplicem, in convulsivum adauget." This account seems to give as much importance to material irritation as if he had entirely declined the consideration of any other cause, for the predisposition is said to consist in a condition of the blood leading to effusion in the lungs, and the next cause of convulsive motions is said to be the serous colluvies affecting the nerves of the lungs, which is every-where referred to.

We next see the Dropsy, the Asthma, and the Scurvy, united in the explanation of the convulsive disorder.†

Afterwards, the language is still less ambiguous, because he directly and plainly terms

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* Willis Opera. Tomus Prior de Morbis Convulsivis, Caput. xii. p. 137.

† Willis de Morb. Convulsiv. Caput xii. p. 138.

that form of Asthma, *purely convulsive*, which arises from the serous colluvies of the habit: "porro interdum observavi *graves Asthmatis* "*paroxysmos*, sine quavis notabili pulmonum "labe accidisse; revera ut putaverim, hunc *mor-* "*bum* aliquando esse *mere convulsivum*, ejusque "insultos solummodo excitari quoniam *serosa col-* "*luvies*, particulis explosivis referta, *nervos*, pul- "monum diastolen perficientes, subiens, spiritibus, "ibidem scatentibus accrevit."*

WILLIS, it thus appears, had not in his contemplation a species of Asthma entirely divested of the character which has been lately only given to the humoral Asthma. Whilst his authority has been followed by the nosologists and teachers of the modern schools of medicine, his meanings have been perverted, or his context not studied. It is only by reference to his doctrine of Convulsive Cough and Asthma in the twelfth chapter, *de Morbis Convulsivis*, and by considering his opinions, "*de Respirationis Læsæ Speciebus*," that his treatise "*de Asthmate*," which follows, can be properly understood. In the latter he alludes to his general theory of the cause of convulsions, and applying it in Asthma, we are to follow his data when we accept his conclusions.†

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* Willis de Morb. Convulsiv. Caput xii. p. 138.

† Vide Opera, tom. Posterior de Asthmate, p. 125.

He first established the doctrine of convulsive motions in Asthma, and succeeding writers have generally contented themselves with adopting his theory. " It is astonishing," says MORGAGNI, " that WILLIS should have been the first who ob-" served the nature of symptoms, which we have " universally, since his time, acknowledged to " exist in Asthma."*

It is indeed remarkable, that physiologists neglected to notice, that convulsion is nothing but a violent or irregular contraction of the muscle or fibre; and if such be the contraction of a muscle of respiration, it may be justly said to have become convulsive or spasmodic.

But if we are surprised that the nature of the contractions in Asthma had not been understood before the time of WILLIS, we may consider it still more extraordinary that succeeding authors should have been so far occupied with reasoning on the new actions, as to forget the state of the habit in which they were said to take place, and which was so conspicuous to this writer as to be esteemed the very cause of the morbid motions which he described.

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* Morgagni, lib. ii. epist. 15, 5.

Nor is it a matter of indifference, whether convulsions existed with or without the excitement of irritating matter in cases of Asthma, since if we give up the point that they existed without an irritating cause in this species, where serosity has been proved to be abundant, the inquirer may be still better satisfied with this easy solution, when applied to other cases (called the dry Asthma) in which an irritating material cannot be very readily discovered; and thus we are led into error by adopting a hasty conclusion, which is drawn from false premises, and contradicts the laws of the animal economy.

SECT. VI.

Anatomical evidence of serous effusion in the cells of the lungs of Asthmatics.—Effusion in complicated cases very frequent; in uncomplicated cases seldom inquired for, but occasionally discovered.—A series of Anatomical Observations applying to complicated and uncomplicated Convulsive Asthma.—The Suffocative Catarrh considered.—Evidence in Living Subjects of Effusion in the Vesiculæ of the Lungs, as palpable as from Dissection.—This Condition supported by the Description of Asthma by Cælius Aurelianus.—Physiological Considerations on the Entrance of Serum into the Air Cavities of the Lungs.—The Experiments of Dr. Goodwin and Dr. Hales.

UNCOMPLICATED Asthma is so seldom fatal, that few opportunities have occurred of searching for its cause by dissection. For this *Morbus Maxime Terribilis*, as it is called by WILLIS, may be carried on to old age, if supervening diseases do not destroy the patient, or disturb the operations of nature, by which a recovery from the paroxysm may be obtained.

Many instances have been found of effusion in the cells of the lungs from complicated causes; and effusions in the sacs of the pleura, and in the pericardium, have been still more generally discovered, as these states are frequently consequences of inflammation, of polypi in the large vessels, or of ossifications of their coats.

Cases of uncomplicated Spasmodic Asthma are not very likely to become objects of examination, as an acute disorder may have attacked the Asthmatic during the protracted course of his complaint, and the contents of the thorax may be marked with the effects of recent inflammation: the patient may have been dropsical, and effusion will be found in the cavity of the breast, or in the cellular substance, as well as in the vesicles of the lungs; or it may only be found in the sacs of the pleura, and the cells of the lungs may have been relieved by absorption, for, whilst the power of the lymphatics remains, they may be expected to use their energies in defence of the last reservoir of vital stimulus.

For these reasons, the presence of accumulated serum in the lungs, might not, in some cases, create surprise; whilst in others the absence of this cause of irritation would rather confirm the prevailing theory than occasion farther inquiry.

Though MORGAGNI frequently discovered such a condition of the air cells, when the patients had laboured under disordered respiration, he generally contents himself with recording the fact; and dwells longer on the alterations of organic structure, which he had an opportunity of remarking. Effusions into the cavities of the chest and of the pericardium also are more carefully noticed than effusion in the vesiculæ and bronchia; the latter could not, in cases commonly occurring, occasion death; the former are frequently causes of death, though their preceding symptoms may be less distressing than the paroxysm of convulsive Asthma.

We are, therefore, not to expect so much demonstrative evidence of effusion in the air cavities in cases of simple Spasmodic Asthma, as in others where that might be the attendant disorder, but where life was terminated by a disease of more decisive violence.

But as there is some light to be obtained from these complicated cases, we shall present a few of them.

I shall likewise be determined by the history of symptoms, to claim, for the advantage of our inquiry, cases which may be classed under other heads, but which I believe to belong to that of convulsive respiration.

OBS. I. MORGAGNI's observation of morbid bodies induced him to give an opinion which applies to our assigned cause of Asthma. He says, that concretions in the bronchial tubes, and indurations of their glandules, very often arose from viscid humours, or pus remaining too long in these passages, or in the air cells at their extremities:* this is informing us in other words that after fluid matter has occasioned Periodic Asthma, it may become the cause of Continued Asthma; a species which has been treated of in the first part of this Inquiry, where may be found much authority in support of the reasonableness of his suggestion.

This author offers us also some detached facts, which are to be classed as complicated cases of Asthma.

OBS. II. The lungs of an Asthmatic subject, described epist. xxii. art. 4. were found in the following state:—The right lobe was sound, but in the lower part very red; the left was universally pale, contracted, and hard, and contained sanious matter.

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* De Causis et Sedibus, lib. ii. epist. xv. art. 19.

Obs. III. Article 34. epist. xviii. A history of the dissection of a patient, whose disease was denominated Convulsive Asthma.

The heart was diseased, and the lungs were filled with a frothy liquor; but there was no effusion in the cavity of the chest.

Obs. IV. Article 30. epist. xxi. A disease of the breast is reported, which was accompanied with laborious respiration. The air cavities of the lungs were found to be filled with frothy serum.

Obs. V. Fabritius Hildanus opened a subject, who became asthmatic after a concussion of the brain. The disease ended fatally, from a catarrh falling on his lungs. The lungs were found every-where filled with a pituitous and viscid fluid. See Cent. I. Obs. XI.

Obs. VI. Hollerius, Prax. lib. i. cap. 25, in scholiis, has informed us of an Asthmatic, in whose lungs, after death, the same pituitous fluid was found as in the preceding case.

Obs. VII. A woman of forty years of age is stated to have died of Asthma; but she had also a stone in the kidney. A great quantity of frothy water was found in the cells and bronchia of the lungs.

This anatomical history is given us by FREDERIC RUYSCH. See his works, tom. i. obs. LVI.

OBS. VIII. For another instance of this morbid appearance in the lungs of a subject, who had suffered the Asthma, see Riverius, observat. LX. Centur. i.

OBS. IX. An Asthmatic died, and his lungs were filled on both sides with serum; but there were likewise adhesions to the diaphragm and pleura. The pylorus was diseased, and also the duodenum and pancreas: the pineal gland was full of white concretions.

This dissection is communicated by H. RIDLEY, in his Observations de Asthmate et Hydrophobia. They are given in German with FLOYER's treatise, by JOANNE CHRISTIAN FREDERIC SCHERF.

The extreme case of serum in the air cells of the lungs must be when concurring diseases have so weakened the patient that the habit cannot be excited to discharge it. When the irritability of the constitution has been so reduced suffocation has really taken place, and many instances have been recorded where the danger of this event was imminent.

OBS. X. MORGAGNI * gives the history of a maiden subject, who died with a fluid running out of her mouth. She had taken cold at the time of menstruation; and difficulty of breathing was the reigning symptom. The abdominal viscera and uterus were in a very morbid state; but the lungs were distended with a *frothy serum.* The dissection does not prove that she died from the state of the lungs only, but that an effusion had taken place in that organ; and it appeared that the natural effort of respiration was unequal to contend with that particular affection, for the fluid issued from her mouth agreeably to the feature which CÆLIUS AURELIANUS has given in his description of Asthma. An instance similar to this, as far as regards the affection of the lungs, will be seen in a patient who survived the discharge, and whose case is an acknowledged Asthma.

Instances of this kind are too numerous to be inserted. I shall, therefore, confine myself to a few cases, which are, in my opinion, evidently instances of Spasmodic Asthma; but without affording subject of theoretical debate, by a connexion with chronic diseases of the viscera. Though agreeably to certain rules that govern the animal motions, diseases of the abdominal viscera may excite Asthma; but this will be shewn under the *Third Species*.—See Sect. xiii.

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* Epist. xxi. xxix.

OBS. XI. In the opening the chest, says Dr. BAILLIE,* " It is not unusual to find that the " lungs do not collapse, but that they fill up " the cavity completely on each side of the heart. " When examined, their cells appear full of air, " so that there is seen upon the surface a prodigious number of small white vesicles; the " branches of the trachea are at the same time " much filled with a mucous fluid. This is not " uncommonly the case in persons who have laboured for some considerable time with difficulty " of breathing, but without any symptoms of inflammation; such persons would appear to die " for want of a supply of atmospheric air sufficient to produce the proper change in the " blood, which is necessary for its useful circulation through the body."

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[*] Morbid Anatomy, p. 50.

Obs. XII. A mason was admitted an out-patient of an Infirmary who had been affected with Asthma for several years, which he traced to a severe cold. The habit of this man was thin, and his temperament inclined to sanguine: the paroxysms had been most severe in the winter, but they had frequently attacked him in the milder seasons. He had generally pursued his labour without much consideration of his disease; allowing himself but one or two days of rest for the paroxysm to abate. At the time of his admission, the pulsations at his wrist were frequently indistinct, and at other times intermitted; his feet were œdematous, his countenance was pale, his breath was always short; he had some cough, but he only expectorated after the paroxysms. He had severe attacks in the evening; and if he was free some weeks from violent symptoms, the invasion of the fit was truly regular in the manner of the Spasmodic Asthma. The physician directed some emetics and absorbents, after the use of which the pulse was more regular. He then took expectorating and diuretic medicines with great relief; and at length was at least so well as to leave off attendance. His pulse was at its former standard, his appetite was mended, his flatulence was gone, expectoration was much more free, his urine was natural, his respiration was not much disturbed by exercise, and the paroxysms were lost. At the beginning of the following winter I was desired to call upon the same man, who having been greatly exposed to wet and cold, was laid up in his own dwelling. His difficulty of breathing was now so great, and the symptoms were so critical as to leave little expectation of his living through the night. The application of blisters to the breast and legs, puking, and then volatile stimulants, gave only temporary relief, and he sunk under his weakness, having had a regular paroxysm two nights before, which had not been succeeded by expectoration.

Upon examining the internal state of the body, the abdominal viscera exhibited no mark of disease, the bowels were emptied of fæces, and the stomach was very flaccid, and expanded in the coats; the head contained no excess of serum, but the vessels were rather turgid; the lungs were very heavy, and being pressed, a frothy liquor was made to issue from his mouth. The substance was then cut open, and the cells and bronchia were found full of serum, of a light colour, unmixed with blood; there was only the usual moisture in the pericardium, and the sacs of the pleura; the heart and large vessels were in a natural state. After the serum had been discharged by pressing the lungs, the mucus, which still adhered to the coats of the vesicles, appeared more frothy than the general mass, and was also of a darker colour, making the membrane in some places nearly black.

The disease described by Dr. MILLAR, has been the subject of doubt; CULLEN places it under Cynanche Trachealis, and considers it as the Croup. It is, however, not clear, that Spasmodic Asthma would be a different disease from this, if it were to attack infancy only; at all events, it appears different so far only as it was accompanied with fever and inflammation. In the extreme irritability of an infant subject, inflammation may occur with other symptoms arising from causes obstructing the air cells, when in adults these same causes may induce asthmatic paroxysms, without exciting fever, or so much sensation as to inflame the organ; for these reasons it may be proper not to omit the observations of Dr. MILLAR on the morbid appearance of two infant subjects.*

OBS. XIII. A child died in the first stage. The external parts were soft and œdematous; the lungs, and all the other bowels were sound; the stomach and intestines were much inflated with rarefied air, but contained no fæces.

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* Vide Dr. Millar on the Asthma and Hooping Cough.

In this instance there is no difficulty in concluding that the child was carried off by a convultion before the lungs could be affected. The great distention of the stomach permits the inference of indigestion having been a previous complaint, and that the first passages were very feeble; this condition might suddenly induce difficulty of breathing, and, in the irritability of infancy, the consequences which happened are not uncommon. The absence of inflammatory appearances in this dissection takes away the probability of the Croup having destroyed the child. It seems to belong to the third species of Convulsive Asthma.—See Sect. xiii.

OBS. XIV. A child died in the second stage described by Dr. MILLAR. She had laboured under violent symptoms of the Asthma till the tenth day.

The vessels of the pleura, on the surface of the lungs, and of the trachea, were turgid, and seemed to have been obstructed; the parts had a livid appearance, resembling that which is observed when an inflammation terminates in a gangrene; the bronchial vessels were filled with a white, tough, gelatinous substance.

The *Suffocative Catarrh* is described by SCHNEIDER as follows;—" It is allied to the

" apoplexy and syncope, but is distinct from those
" affections; the diagnostic signs are, a weight
" and pain of the breast, a difficulty of respiration,
" an interrupted voice, danger of suffocation, anxiety,
" sometimes a cough, a slow pulse; the
" membrane lining the nose and mouth before, and
" behind, discharges a flux of serum, with which
" the mouth is occasionally filled."*

If wheezing had been a symptom described by SCHNEIDER, and the inflammation of the mucous membrane of the nose and mouth had been omitted, the character given of Suffocative Catarrh would not have been improperly applied to Spasmodic Asthma: there is, doubtless a distinction between the diseases; but there may be subjects affected with this Catarrh in whom the line of separation will be lost.

If the tone of the exhalents of the lungs be greatly reduced, whilst the habit of the patient is still disposed to a ready association of muscles, and particularly to the morbid contraction of the respiratory muscles, Asthma may be the disease occasioned by the defluxion, which, in other subjects, might be called Suffocative Catarrh.

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* Schneiderus de Catarrho, l. v. c. 4.

OBS. XV. The history of the Catarrh which prevailed in Italy in the year 1730,* gives a specimen of Asthma terminating the more acute disease.

The cardinal JOHANNES FRANCISCUS BARBADICUS died of a disorder, which MORGAGNI calls a Suffocative Catarrh, and which was probably a species of that epidemic which is now called influenza: whatever were the affection, its progress was marked by so considerable a disorder of respiration as to merit the name of Asthma, and when the patient could no longer expectorate, he died from suffocation. His lungs were found full of serous fluid; but there was no adhesion, or other mark of inflammation. His physician's words are as follow:—" Graves erant ipsi pulmones, sed a " catarrhali, quam continebant, materia, multa pas- " sim e bronchiis, quacunque incideres, erumpente. " Certe eorum omnis substantia flaccida, non modo " non densa, aut compacta reperta est." The subject was gibbous, and seventy-two years of age, and as he had been frequently affected with defluxions on the lungs, the termination of the disorder could excite no surprise, any more than the morbid appearances on dissection. Had this plentiful effusion of mucus, or serum, fallen on the lungs of a younger man, whose irritability had been less exhausted, the energy of the respiratory muscles, and of the absorbing vessels, might have been equal to the task of relieving the organ from the oppressive fluid ; and the patient might probably have recovered.

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* The epidemic catarrh, or influenza, raged on the Continent, 1580, 1675. See Bergerus de Circul. Lymphæ, C. ii. § 7. Forestus, lib. vi. obs. 3.

MORGAGNI particularly asserts, that this patient was not affected before he died, with any symptom of peripneumonic fever, nor were any signs to be discovered in the lungs of such an affection, after death. We may safely say, that he expired under a paroxysm of Asthma, in which the convulsive motions were as strong as his irritability would admit.*

OBS. XVI. An ecclesiastic advanced in life, with a short neck, and fat, had been long out of health : he led a sedentary life, and was cachectic. *(Cocochymiam valde scorbuticam contraxerat.)* He was so affected with difficult respiration, and heaviness of the head, that he was incapable of any exercise, except that of going to chapel, and of returning every day. There he was seized with a fit of insensibility, and soon died.

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* See Morgagni, epist. xiii.

The following day the body was opened; and there was no doubt of a disease so suddenly fatal, having left vestages in the brain where the cause probably lay. The encephalon was accurately examined, but, to the surprise of all, was sound, "*Morbi, licet atrocissimi ne vel umbra quædam superérat.*" Proceeding to the thorax, the heart was found perfectly firm, and entirely free from any obstruction or polypous concretion. The cause of the laborious respiration, and ultimately of the death of this patient, was at last discovered in the substance of the lungs, this organ being discoloured, and its vesicular cavities entirely filled with a *frothy serum.*[*]

Thus dissection has furnished some instruction in this Inquiry, but still more is to be obtained from a consideration of the following important case, in which the genuine cause of one species of Convulsive Asthma is shewn more convincingly than by dissection of a dead body; at the same time it serves to confirm the conclusion which the cases we have just given lead to, and it also obviates the objection, that the appearances, after death, may have been effects of the disease, instead of the cause.

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[*] Boneti Sepulchret. Anatom. lib. i. sect. ii. obs. 57.

A female * was seized with a complaint that very much resembled the paroxysm of Spasmodic Asthma; it was, however, more violent than first attacks usually are, and its remission was attended with a very copious discharge of *frothy serum* from the bronchia, which was thrown up by a slight, though almost continual cough. After occasional relief, the disease returned in sixteen months with as much violence as at first. She was then attacked, after comfortable rest, at five in the morning, with Dyspnœa and Convulsive Cough; danger of suffocation was soon perceived; the senses forsook her, the face became livid, the extremeties were cold, and the pulsation at the wrist was lost: this state continued for two hours, during which time a very large quantity of frothy serum, tinged a little with blood, was discharged, without any visible effort, by the mouth and nostrils. "Then some "very faint and involuntary efforts to cough came "on, which gradually increased, *and with every* "*effort large quantities of the frothy serum were* "*thrown off; perhaps the whole quantity might* "*amount to three or four pints.* About three hours "after the time of attack, the difficulty of breath"ing became very sensibly diminished, and her

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* A patient of Mr. Baynton, of Bristol. See Considerations on the Medicinal Power of Factitious Airs, by Dr. Beddoes and Mr. Watt, P. IV. p. 53.

"senses were observed to return." Dr. BEDDOES says, the fluid which was discharged was ascertained, by careful inquiry, to be *mucus*, and not saliva. The predisponent causes were such as lead to Spasmodic Asthma; and both Dr. DARWIN and Dr. BEDDOES considered it to be an extraordinary instance of that disorder.

It is extraordinary from the very considerable excretion of serum; for a more moderate collection is to be supposed, where no excretion is observed; and we must be very inattentive in applying the function of absorption to the disorders of the lungs, if we give it no importance in such cases; but though I see in this instance very fortunate evidence of the cause of the disease, and such as cannot commonly be expected to appear in a living subject, from the activity of absorbing powers, yet the description is not solitary in modern medicine. A similar case is to be seen in the works of ALEX. MUNRO, sen.* in which a fluid was discharged from the lungs, but its accumulation had been more gradual, and the irritability of the habit was not so deficient as in the female patient.

We shall find also, by going farther back, that CÆLIUS AURELIANUS † makes this excess of

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* Works of Alex. Munro, sen. p. 604.

† Morborum Chronicorum Lib. iii. cap. 1.

mucous fluid a diagnostic in the worst cases of Asthma; and his reference to the most violent state of the disorder takes away all doubt of the appearance belonging to that form which is called convulsive. After mentioning the common symptoms in which are included wheezing, a cough dry, and then moist, spittings thin and frothy, and afterwards more thick and viscid, he proceeds to say, " At si gravior impetus superpositionis*
" fuerit, ora ægrotantium livescunt, et quidem
" excluso per nares humoro mucilento, relevantur,
" atque præfocationis carent metu, quod non
" aliter cedit, etiamsi per oculos lacrymarum fuerit
" fluor."

It is known with what energy the entrance of a single drop of fluid would be resisted by the passage of the larynx, yet the insidious entrance of serum into the vesiculæ is not productive of such acute distress. That it may be borne in these cavities without instant death, when it has taken possession, is proved by Dr. GOODWIN. He poured water through an opening into the trachea of a cat: the experiment induced great difficulty of breathing, and a feeble pulse; but the animal recovered, in repeated instances, from the sudden impression, to a state of seeming ease.†

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* Superpositionis, i. e. *Paroxysmi.*

† Connexion of Life with Respiration, p. 17.

Dr. Goodwin finished his experiments on cats by destroying them after a few hours. It would have been more satisfactory to have heard what symptoms appeared in a longer time; with this view the following experiment was made, which with some modifications, was repeated on cats. These animals are more tenacious of life than most others; and it was found that they would take a greater quantity of fluid into the lungs, without immediate suffocation, in proportion to their bulk, than the dog.

I confined a dog in an erect posture, and with the assistance of an ingenious friend, opened the trachea, and poured in four ounces of serum of cow's blood, warm; the passage was then properly closed. The dog was set at liberty within the bounds of a kennel, three feet by four, and open to the air in the front; he was affected with great difficulty of breathing, lay down panting, but suddenly arose with great emotion, and continued on his legs, with quick respiration, for some time. The distress gradually disappeared in four hours; but he refused food, and appeared to sleep. In sixteen hours he became unruly, and made violent efforts to release himself: broth with oatmeal was given him, which he at first took with eagerness, but he soon left off eating, and was as restless as ever; his respiration was very laborious, and his eyes were suffused with water; the floor of the kennel was very wet, and I had observed that he passed urine. After this state had continued till the twenty-sixth hour from the operation, with more or less Dyspnœa and anxiety, he became much more quiet: his breathing, in thirty-four hours, appeared to be natural; but he then began to rub his neck, and scratch the wound. It was soon perceived that a great inflammation was come upon the integuments; and from the trouble which the animal gave, and the pain he was in, I directed him to be strangled. Upon opening the lungs, there were collected one ounce and a half of fluid, which was much more ropy than the serum poured into the trachea; two ounces and a half, with any ordinary mucus natural to the cavities, had therefore been absorbed, or exhaled, in the vapour of the dog's expirations.

It appears by the experiments of Dr. HALES, that water poured into the wind-pipe may pass through the bronchia into the pulmonary artery; but in the reverse direction the passage of this fluid is so free, as to run from the artery into the air vessels four-fifths faster.

Serum of a hog's blood was afterwards tried, and it passed from the pulmonary artery most freely into the bronchia, but not into the veins.

But though serum passed with this facility from the arterial capillaries into the air pipes of the lungs, and doubtless with greater ease after death than in a living subject, it was found that globules of red blood would not pass through these exhalent mouths into the vesicles, though considerable force was made use of.*

Hence Dr. HALES infers, that some Asthmas may arise from the effusion into the vesicular cavities.

"When we see," says this philosopher, "how "freely the serum passed from the pulmonary "artery into the cavity of the vesicles and bron-"chia, it is no wonder that so great discharges "of humours are often made through the same "passages, when the blood is much diluted by "being, in colds, surcharged with too much "obstructed perspirable matter, or otherwise dis-"ordered: hence, also, some Asthmas have their "origin."†

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* Hale's Statical Essays, Exper. xi. &c.

† Statical Essays, Vol. II. p. 88.

SECT. VII.

Floyer, Hoffman, and Cullen, on Asthma.—Description of the disease by Aretæus.—The capillary exhalents of the lungs unlike convoluted glands.—The use and indication of Convulsive Respiration.—The effect of frequent recurrence of Spasm discovered by analogy of irritation situated in other organs.—Effect of irritation applied to different parts of the pulmonary system.—Diagnostic Symptoms.—The Difficulty of Breathing.—Cough.—Straitness.—Wheezing.—Relief from discharge of mucus.—A person recovered from drowning presents an explanation of wheezing in Asthma.—Objections to the Theory of Spasmodic Constriction.

THE writers of authority, who succeeded WILLIS, have involved us in the uncertainty of their own conjectures. If we are to believe them, the nerves have been implanted in the animal system, to remind man of his misfortunes, and to betray the œconomy of life into perpetual derangement, and torments scarcely to be endured.

Sir J. FLOYER says, " the Periodic Asthma
" depends on the constriction of the bronchia
" and bladders of the lungs, by windy spirits:"

as this state had never been proved, it might very properly have been neglected, till a well digested examination of real appearances had been found insufficient to explain the cause, or to afford indications of cure. He did not, however, omit to remark the excess of contraction in the respiratory muscles of the breast and abdomen; and thus far he was consistent with his own injunctions to physicians, "of describing all sensible phænomena."

It is difficult to escape the charge of inconsistency, when this plain ground of *visible effects* is deserted, and the mind of the philosopher, impatient of slow progress and careful induction, launches into hypothesis.

The doctrines of FLOYER, HOFFMAN, and CULLEN, on the proximate cause of Asthma, are now accepted without much debate, as affording the easiest solution of the symptoms; and if the method of treating the disease had been successful, it would be at least useless, if not invidious, to condemn critically the principles on which it was pursued; we have, however, a confession of the greatest weight to raise the scepticism of practitioners. No agent has yet been discovered, which, in the opinion of Dr. CULLEN, can certainly remove Asthma; and we may, therefore, rationally object, that the cause assigned by the Professor is no proper direction to a cure, and that its existence may be doubted. As this writer has taken FLOYER and HOFFMAN for his authority, and given the last finish to their theories, it might be sufficient to make some remarks on his opinions.

I shall, however, observe, on HOFFMAN, that whatever may be his theory, his descriptions of the Humid, Flatulent, Spasmodic, Hypochondriac, cases of Asthma, &c. point out causes of irritation in common to all the species, and producing the same effects in greater or less degree. He admires the description of Aretæus with great reason, and even accepts it as his text in explaining the disease. This accurate writer did not omit to mark the expectoration of *frothy aqueous matter*; finally, in a fatal event, *suffocation;* in a fortunate one, *free and moist expectoration, with copious urine and watery stools*.*

ARETÆUS informs us, that the disease terminates in suffocation generally, not often in recovery. From this it is probable, that he applied the phænomena of Asthma where they would uniformly appear, in diseases of great irritation and oppression of the pulmonary organ; for the account before us must embrace many cases of stronger influence on the actions of life than those which the generic term of the present day is made to comprehend; though it comply strictly with the natural fact, as is proved by the cases in the last section.

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* Aretæus, lib. iii. cap. 11.

Cullen considers the disease to be without a *manifest cause*, but has marked for a diagnostic the afflux of serum to the lungs in the following words: "Cum sputo muci sæpe copioso."

It is obvious, that mucus could not have been expectorated without a previous secretion of serum. But as this mucus is copiously discharged, the effusion of serum must have been considerable: it may be therefore proper to inquire in what state of the lungs such an effusion can take place. It is known that the glandules of the trachea and bronchia are subject to inflammation, and that in Catarrh an excretion of mucus is considerable from this condition of their vessels; but practitioners have generally testified, that pyrexia and symptoms of inflammation are not present in Spasmodic Asthma.

We must then look farther for the source of this copious secretion, and we shall find it in the vessels with exhalent orifices at the extremities of the air pipes: the construction of which is not complex like that of the mucous glandules; and they have not follicles in which they may deposit their lymph till it be excreted. There are many reasons for believing this to be the principal, if not the only source of the copious expectoration in Asthma.

In consequence of the condition of the habit in Asthma, the matter of heat is not given out in this as in other instances of glandular secretion. The capillary vessels are passive in this disease, and, not contracting so narrowly as to detain the gross part of the current, they permit lymph to pass instead of exhaling only a thin vapour.

There is as little difficulty in assenting to the position of a torpor * of these capillary extremities, as to that of their increased activity. In one case we must allow them the power of contracting, greater in proportion than what belongs to the trunks from which they proceed; and in the other less. The latter state is as consistent with rational phy-

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* *Torpor* and *Quiescence* appear to me properly expressive of the condition of a capillary vessel, which is not irritated to contract by its contents; but I am not certain that my application of these terms corresponds with the meaning of the learned physician, who introduced them.

siology as the former, and each may exist in different habits.

The exquisite labour of respiration from the irritation of this fluid is conformable to animal laws, though it may seem to counteract its own purpose; but, in the early period of the complaint a quickness of respiration commonly precedes the paroxysm that the expirations may quietly carry off, in vapour, the serum from the cavities: the action of the absorbents is quickened, it is probable, in the same proportion, that by the united powers of these instruments, the balance may be restored between absorption and exhalation. If this object be not soon accomplished, the convulsive respiration may take place. It is the *Difficultas Spirandi* of CULLEN, which is repeated at intervals till it be answered by the desired effect, or the powers of the system are exhausted by the effort.*

In the same manner Acrid Bile in the intestines occasions an increased peristaltic motion, by which the œconomy of nature and habit intends the expulsion of the matter, but if it be not discharged by these efforts, an inverted motion may take place which will counteract the purpose of relief, as perfectly as the convulsive respiration opposes this object in cases of Asthma. Ileus is then produced, where less sensibility of injury, or less exertion to remove it, might have been followed by a regular discharge of fæces.

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* See Sect. I.

In menstruation and in parturition, a similar excess of muscular contractions frequently opposes the discharge which nature intends, and this must be moderated before she can accomplish her purpose.

We see, then, that the actions called *Difficulty of Breathing* naturally follow the obstructed state of the lungs. We shall next consider how this state may occasion the other symptoms.

Irritation produces, in the pulmonary system, effects different in quantity and manner, according to the part of the organ on which it falls. If a drop of the most limpid water fall into the larynx, it excites a more violent cough than is occasioned by the serum effused in the air cells at the extremities of the wind-pipe.

This shews the difference between a catarrhal cough and an asthmatic one; the lymph accumulated in the air cells is rather oppressive than acrimonious, and the sensibility of their membrane is less than that of any part of the bronchia and trachea. But, besides the vesicle being less sensible of irritation, it cannot collapse in the attempt at expiration from its cavity being filled with lymph, which is the true cause of a paroxysm beginning with *little or no cough*, and that seemingly impeded; but after the fluid has been lessened by absorption, still more may be discharged in the vapour of expiration, and the elasticity of the bronchia being thus restored, the much-desired *spitting of mucus* may take place.

By the same state of the lungs we may account for the *Straitness* and *Anxiety*. The air cells are occupied by lymph; the bronchia are straitened by the same matter in a more viscid state; the diaphragm cannot descend as it used to do, on account of the resistance of the stomach which is distended with flatus, and because the trachea is narrowed by the pressure of the œsophagus, affected like the stomach: the external respiratory muscles then endeavour to dilate the thorax, by lifting up the ribs and sternum, but they cannot accomplish the object of filling the air cavities thus obstructed, or of forcing down the diaphragm, which, by its own contractions, had been unable to conquer the resistance of the stomach: these real *obstacles to a free and full* *inspiration, equally prevent a free and full expiration,*[*] which cannot take place till the vesicles collapse. We have therefore no necessity of appealing to a Spasmodic Constriction of the bronchia to account for these symptoms until that state be made more certain.

FLOYER observes, with regard to the *Straitness,*[†] "that it does not depend on a great "quantity of phlegm, because the lungs do not "appear to be much oppressed with phlegm "before the fit; and at the end of the fit the "straitness goes off, before any considerable "quantity is spit up:" but though we have accounted for the straitness by the existing state of the stomach, as well as of the lungs, I believe the last to be the principal cause, notwithstanding the remark of FLOYER; for there must be a point of time when the activity of the absorbents has lessened the quantity of serum collected in the air cells, and a degree of oppression being taken off at that time, some returns of action in the bronchial rings and vesicular membranes, will be obtained; relief may then be perceived in the breast before the excretion of phlegm takes place, but not before it has been reduced to a quantity which may be controuled, when expectoration partially proceeds with critical relief to the patient.

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[*] Cullen's Practice, MCCCLXXXIV.

[†] Page 7.

The *wheezing* is a symptom united by CULLEN with the straitness and anxiety; but in addition to the obstruction of the tubes which admit and discharge air, we are not to forget the distention of the œsophagus, which is so considerable in hysterical patients, and which may prevail in all dyspeptic cases. If the trachea be compressed by any cause, wheezing will be the effect. In hysteria it may be produced by this distention, though lymph had been effused, and the spitting prevented by active absorption; and this consideration may answer the remark of FLOYER,* that "wheezing does not depend on "phlegm, because the hysteric, who have no "phlegm, wheeze very much."

Wheezing and straitness of the breast very frequently remain in a greater or less degree between the fits, when the convulsive actions of the muscles have subsided, which shews the inadequacy of a Spasmodic Constriction as the cause, since no one is ready to assert the constancy of spasm, without relaxation for a long period. The wheezing generally continues through the disease, gradually becoming less, till the secretion of lymph is reduced to the usual quantity, and the œsophagus no longer compresses the trachea, flatulence and indigestion being removed, when it ceases.

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* Page 43.

To confirm our explanation, we find this symptom in Phthisis attributed to the mucus or pus stuffing the trachea.* Wheezing is the same sound in Phthisis as in Asthma; but the observer was not biassed by authority to assign it to spasm.

We also see it accompany the condition of a person recovering from suspended animation after water had been received into the lungs. Dr. GOODWIN says, "a difficult and stertorous re-"spiration is observed. This inconvenience arises "from some water still remaining in the lungs,

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* White on Phthisis Pulmonalis.

"which will be gradually evaporated by the expired air."*

As to a Spasmodic Constriction of the bronchia, which in the opinion of CULLEN, is the proximate cause of the disease, there are many objections to be opposed to this theory.

1. Dyspnœa has the same appearance to an observer as Asthma, excepting that it is more constant than the latter, and CULLEN assigns to it the same causes as to Continued Asthma: if therefore this affection can exist without constriction of the bronchia as a proximate cause, so may Convulsive Asthma.

2. The straitness of the breast, some dyspnœa, and wheezing, remain between the fits in many instances, which should prove the continued presence of a Spasmodic Constriction though this state, by the laws of animal life, cannot be permanent.

3. This continuance of symptoms between the fits is acknowledged by all writers and particularly of those symptoms which are most necessary

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* Goodwin on Animal life and Respiration, p. 118.

to prove the spasm of the bronchia; as wheezing and straitness.

4. The spasm is said to be readily excited by "turgescence of the blood, or other cause of "any unusual fulness and distention of the vessels "of the lungs;"* in this case Dyspnœa would be more certainly attended by wheezing than Asthma is, which is not allowed, nor is Dyspnœa said by the Professor to be owing to spasm of the bronchia.

5. A fit of Convulsive Asthma of this species cannot be suspended by four grains of opium, which would probably be the case if it depended on spasm only.

6. In Catarrh and Phthisis a spasm of the bronchia is not affirmed, though the material continually discharged may be supposed to irritate and in fact does bring on laborious breathing occasionally.

7. The Constriction has never been shewn by

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* Cullen's Practice, MCCCLXXXIV.

dissection; but in cases of vomicæ, where the lungs had been much irritated, it has been discovered by dissection, that the "*branches of the* "*trachea are never in any degree contracted.*"*

8. Where the irritability of the constitution is not worn out, the act of dying is attended by the same muscular efforts and uneasiness of the breast as are felt in the paroxysm of Asthma; but no constriction of the bronchia has been afterwards discovered, which might be expected, if it were a part of the last condition of the lungs. Since universal relaxation of the body is not a constant effect of dying, as may be proved by many instances.

Lastly. The supposed cause has never led to a successful practice, for Anti-spasmodics have only been useful in the fourth species; and in many cases the actions of the external muscles have been taken for the evidence of constriction, under the confused term of Difficulty of Breathing.

It is not, however, intended to deny the possible existence of this spasm, but to object to it as a proximate cause, and to state the imprudence of depending upon it as an important indication in the practice. If spasm of the bronchia be considered necessary to the pathology of the disease, it surely may be better defended as a consequence of the effusion, than the effusion can be supported as the effect of the constriction.

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* Dr. Stark's works, p. 28, 29.

SECT. VIII.

Asthma compared with other dieases, bearing analogy in their causes.—Observation on the Humoral Asthma.—Catarrh.—Phthisis.—Asthma, Lethargy, and Apoplexy.—The intercurrence of these affections.—One Species of Asthma is a temporary Dropsy, distinct from hydrothorax and anasarca of the lungs.—Asthma, Dropsy, and Insanity.

ASTHMA is so strongly marked, that there can be little difficulty in knowing the disease; yet it will elucidate the subject, to shew its distinction from some other diseases to which it may bear an analogy in its causes and effects.

Defluxions on the upper part of the lungs and Sneiderian membrane are usually inflammatory affections of the mucous glands which line the passage of the nose, fauces, and trachea, as far as its divisions, and possibly lower in the breast, but not extending to the extremities of the air pipes.

The Catarrhal disposition is very frequently followed by Asthma, because repeated inflammation of the capillary vessels and mucous excretories, lessens their power of contraction, and of resisting the impulse of the circulation though rendered weaker than was usual in health. They then become subject to the influence of exciting causes of little force in comparison with what they formerly yielded to. For this reason elderly persons have their natural excretion of mucus much more copious, in proportion as they may have been more affected by catarrh, and they are accordingly more liable to Asthma. If the inflammatory disposition be not wholly lost in these persons, by the progressive debility of the vessels of the lungs, Peripneumonia Notha will be the character of their pulmonary disease, attended often with great danger.

I am aware that this species will be designedly confounded, by many reasoners, with the Humoral Asthma; but it is time that the distinction of *Humoral* and *Convulsive* should be better understood. If mucus be discharged in greater quantity in one case than in another, the respiratory actions being the same in both, there is no good reason for calling one only convulsive. Is not every Humoral Asthma convulsive? If the unfortunate patient have so little irritability as not to be excited to cough and expectorate, the phlegm must suffocate him unless the absorbing vessels carry it off: and this process is attended by Convulsive respiration. But though the Humoral must be Convulsive, the Convulsive Asthma is not always Humoral; for we shall see that irritation may exist in a more subtle form than that of lymph.

It is not consistent with the rules of the animal œconomy, that Catarrh should be attended by those violent contractions of the muscles of respiration which are symptomatic of Convulsive Asthma. Fever attends both Catarrh and Phthisis; and we may observe, though we cannot assign a reason for the fact, that when this affection of the constitution takes place, it generally terminates convulsive motions.

If Catarrh occasionally lead to Asthma, it still oftener brings on *Phthisis*, a disease which depends on a state of the lungs, opposite to that which permits serous effusion.

In Asthma, an excess of blood in the pulmonary vessels may very probably precede the exhalation of the finer part into the vesiculæ and bronchia: this plethora is local, arising from the relaxed texture of the coats of the vessels, and relieves itself by effusion.

In incipient *Phthisis* the arterial impulse is more considerable than in health, but the predisposition of the pulmonary vessels is not favourable to a relief by effusion, till the fever has acquired strength, when coagulable lymph instead of pellucid serum comes to be effused.

It is therefore to be allowed, that there is a predisposition, in consequence of which inflammation may affect the arterial extremities, and produce Phthisis, as doubtless there is a predisposition leading to that atonic state of the vascular part of the pulmonary system producing Asthma.

There may be also an intermediate state, in which a balance is for some time preserved between the crisis of inflammation sealing up the orifices of the arterial exhalents, and of their distention gradually acquired, at last permitting the escape of the finer fluid, and affording the consequent relief of arterial fulness; but it is probable that this balance cannot be long kept up where the predisposing causes have had a considerable influence, and that if the exhalents do not dilate soon in consumptive habits, Phthisis must take place; and in persons of an opposite constitution, which I conceive is favourable to asthma, the effusion of lymph into the air cells and bronchia will determine, in no long time, the future character of the pulmonary disease.

Lethargic affections have been considered as allied to pulmonary complaints by many authors; so much so, as to create a question if the cause of lethargy did not exist in the lungs.

HIPPOCRATES says, "lethargic diseases are the "same as peripneumonic, and not altogether different from the humid peripneumony" (Peripneumonia Notha.) Some of his commentators have even defended this opinion by the practical remark, that lethargy is critically relieved by the expectoration of purulent or serous fluid.

The lethargic symptoms in Asthma and Peripneumony are sufficiently accounted for by the interruption to the course of the blood from the right side of the heart to the left, obstructing the influx of venous blood from the head. The natural consequence in bad cases of Asthma is Apoplexy, or such a degree of lethargy as approaches that dangerous disease in its character.

Asthma being thus occasioned by serum in the air cells of the lungs, may be considered as an *Hydropic Disease;* but it is obviously distinct from

Hydrothorax, in which the water is collected in the sacs of the pleura, and from that anasarcous state of which the seat is the cellular texture of the lungs. In each of these situations it will occasion dyspnœa, which, though subject to exacerbations, from accidental causes, will not generally put on the form of Periodic Asthma.

We have sufficient testimony of the connexion of Asthma with Dropsy in the histories of practical authors, frequently pointing out the intercurrence of symptoms and the changes of one disease into the other, when Asthma has been of long standing; some proof of this is contained in Sect. VI. of this Inquiry.

HOFFMAN and WILLIS have particularly noticed the hydropic appearance of the feet, and the tendency to general dropsy in Asthma: and the observation of these authors is supported by that of other practitioners.

SYDENHAM opens his treatise of the Dropsy, by stating the first symptom of that disorder to be the swelling of the legs, and the pitting of the ancles from the pressure of the fingers: but this is not so certain a sign in women as in men; nor even in the latter is it to be considered as an absolute certainty of the disease having commenced. He then proceeds with the following observation:

"Etenim cum senex quispiam, habitu corporis
"paulo pleniori præditus, *Asthmate* jam a multis
"annis laborans, ab eodem derepente, idque
"hyemis tempore, fuerit liberatus, mox ingens
"tumor musculos tibiarum occupabit, Hydropicorum
"tumores æmulans, qui hyeme etiam magis
"quam æstate, tempestate magis pluviâ quam
"serenâ, pariter invalescit, et tamen sine quovis
"incommodo insigniori, eundem ad libitinam
"usque comitabitur. Quo non obstante, si generaliter
"loquamur, suræ et tibiæ intumescentes,
"etiam in viris, pro signo supervenientis hydropis
"habendæ sunt; maxime si ita affecti spiritum
"ægrius ducant."*

This sagacious observer might have attributed the swelling of the legs, with great truth, to hydropic effusion in the Asthmatic, as well as in other cases; and the cessation of the Asthma when these swellings commenced, seems to corroborate, beyond dispute, the theory, that both affections depended on one cause. The swelling was larger in winter than in summer, in moist weather than in dry. Alterations in the atmosphere rapidly affect the Asthmatic, and change his habit from a perspiring to an imbibing state, and whether the water stagnate in the air cells of the lungs, or be taken up by the absorbents, and be again effused in the lower extremities, the identity of the cause is sufficiently plain.

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* Sydenhami Opera: Tractatus de Hydrope.

Insanity sometimes suspends Consumption, and Consumption supersedes Insanity; Asthma is likewise succeeded occasionally by Insanity; probably in consequence of the turgid state of the vessels of the head, which is caused by the difficulty with which the right side of the heart propels the blood through the lungs to the left. In the hydropic diathesis, so frequently accompanying advanced Asthma, the disease of the head is still more frequent.

The following two cases* deserve attention. In one, the patient had alternately Asthma and Insanity: in the other there appeared Anasarca and Insanity at the same time. The treatment was successful, though founded on the sole indication of curing the Dropsy.

We conclude, then, that Asthma, Insanity, and Dropsy, had the same cause; for, if Insanity and Asthma were one disease, and Insanity and

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[*] Withering on the Fox Glove, cases 24 and 34.

Dropsy were one disease, *Asthma* and *Dropsy* must be one disease.

There can be no difficulty in assenting to the connexion between the diseases of Asthma and Dropsy, which, by local difficulty in the circulation between the head and chest, may give rise to organic obstruction in the head.*

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* Arnold's, observations on the nature, kinds, causes, &c. of Insanity.

SECT. IX.

Additional symptoms considered, and referred to the same causes. —Remissions of Convulsive Respiration.—Anxiety of the præcordia, and straitness of the breast.—Itching of the neck and breast.—Obscure heat without fever.—Dyspepsia.—Head-ache, sleepiness and flatulence.—Nocturnal access of the paroxysm.—The power of volition in suspending Epilepsy and Asthma.—Asthmatic diabetes.—The union of oxygen with the blood, the absorption of heat, and the discharge of aqueous vapour.—Deficiency of oxygen from the condition of the vesicles, and consequent debility of the heart and arteries.—Polypi of heart.—Syncope.—Irregular pulse.—Coldness of the lower limbs.—The intermitting pulse.—Correspondence of the stomach and heart.—Expectoration of black mucus.—The blood saturated with carbon.—General remarks.

WE have seen in the preceding sections, that the observations of modern physicians have strengthened the authority of the ancient writers; and that dissections have confirmed their facts, as to the cause of *one Species of* Convulsive Asthma being an excess of serum in the air vessels of the lungs. The diagnostics* of Professor CULLEN, were only to be explained by tracing them to this source from which they naturally arose. But there are other symptoms, which, though not constantly meeting in the same paroxysm, very generally attend the disease, and give additional support to this proximate cause.

The contracting muscles by the laws of the animal œconomy, have alternations of exertion and rest. After a muscle has been for some time stimulated to contract, a relaxation will succeed, though the stimulating cause may continue in force.† Happy is the Asthmatic, who, in consequence of repeated paroxysms, is not influenced by the secondary law of habit; for morbid contractions of the muscles will also continue or return at intervals, though the stimulus which first excited them be removed, as happens in tenesmus for some time after the exclusion of acrid excrement.‡

The exacerbation of convulsive asthma will at least return every evening whilst the cause of the irritation continues, decreasing in violence in proportion as the offending matter is discharged, and becomes less oppressive: thus, though the whole object be not gained till the paroxysm ceases, something is obtained at every remission of these natural efforts.

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* See Sect. vii.

† See Zoonomia, Vol. I. Sect. xii. i. 3.

‡ Ibid. Sect. xii. iv. 3.

Anxiety is owing to the difficulty attending the efforts of nature to remove an irritating offence.* If this exist in the chest, we shall be more satisfied with the pathology, because it is here that physicians have long referred the perception called *anxiety of the præcordia;* differing very little from the anxiety belonging to Asthma.

An *Itching of the Skin*, of the breast and neck, is frequently a symptom in the asthmatic paroxysm, sometimes preceding the violence of the fit, and generally declining as the agony of respiration increases; this may be the effect of sympathy with the lungs and first passages. Irritating matter in the stomach is as probable a cause of this symptom, as the lymph obstructing the air cells, since hysteric and hypochondriac patients, who universally suffer dyspepsia, are very much affected with it.

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* See Gaubii Instit. Patholog. Med. 686, 687.

The difficulty with which the venous blood is returned to the heart, from the state of the right ventricle and of the pulmonary artery which we have mentioned, may be an additional cause of this affection of the skin, because in this state of venous circulation, the superficial vessels will be more charged with blood.

There is frequently a remarkable *Perception of Heat.* This may have induced FLOYER and other writers to speak of fever in this disease, but an attention to the pulse gives no countenance to the observation; as the quickness of the pulse seldom amounts, in uncomplicated cases, to one hundred beats in a minute; and the general standard is from eighty to ninety.

A great *desire of cool air* also attends, probably occasioned by a deficiency of oxygen, the means of obtaining which will be increased in proportion as the air is often changed, or more fresh air admitted.

Closeness is particularly disagreeable to the Asthmatic. "The patient," says Aretæus, "loves walking in the open air, with his mouth open, and is dissatisfied with the largest house, which seems too small to breathe in."*

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* Aretæus, lib. iii. cap. 11.

The sense of heat through the body is not a constant symptom, for more frequently the lower extremities are very cold in the paroxysm; and when the patient himself has the perception of heat in the external parts, there is no increase of temperature if the thermometer be applied to the skin.

I have frequently considered this circumstance, and I can only satisfy myself by attributing it to the slowness of the venous circulation in the superficial vessels. This partly arises from that impediment to a free entrance of the blood into the right side of the heart, which is occasioned by the compression of the pulmonary vessels, and probably in a greater degree from the torpor of the muscular parts, and the properties of the blood itself.

Dyspepsia is a condition of the stomach which will be found always to have preceded this species of the Periodic Asthma; comprising amongst its symptoms the *flatulencies* of the stomach and bowels, the *pain over the head and eyes*, and the *sleepiness*.

The *Attack of the paroxysm in the night* is a peculiar feature, and gave rise to the following suggestion of the ingenious Mr. CHARLES DARWIN:

"* Do the periodic returns of nocturnal Asthma
"rise from a temporary dropsy of the lungs, col-
"lected during their more torpid state in sound
"sleep, and then re-absorbed by the vehement
"efforts of the disordered organs of respiration,
"and carried off by the copious sweats about the
"head and neck?"

The copious sweats about the head and neck are so uncommon as only to be seen in subjects of very plethoric habits, and in such as are affected with that form of Asthma called Humoral, which the species now treated of embraces. It appears indeed that a distinction between these forms cannot possibly be established, since the absence of mucus, in some fits of the Asthma, or the access of the disorder not occurring at the usual periods, or at the customary hours, can scarcely ever be traced to two regular deviations; and it is acknowledged, that the Humoral and Convulsive are much blended, so that instead of looking for a different cause for each, we may reasonably refer to the natural laws of the habit in accounting for the occasional absence of one or more of the common symptoms.

The muscles subservient to the function of respiration have been said by anatomists to be in some measure influenced by volition, and on this account they have long since distinguished them as having a mixed motion, that is, partly voluntary, partly involuntary: if this be the case, respiration will be performed in the most perfect manner when neither of these powers is deficient, and in proportion as one is feeble, the function will be served with less energy.

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* Vide Zoonomia, Sect. XXIX. Vol. I.

But the paroxysm comes on after the patient has been absorbed in sleep, when volition or *voluntary* power being suspended, *involuntary* power, or that of irritation must perform the whole duty. Effusion of serum in the air cells having previously taken place, if respiratory action be now diminished, that moment when the oppression of the serum can be no longer borne will be accelerated, because less vapour will be exhaled in expiration, and the absorbing vessels are not able to remove the inconvenience without assistance.

When this period arrives, those extraordinary efforts commence which consititute the paroxysm of Asthma, and which are the *nisus* of nature to relieve herself from injury. This accounts for the circumstance which Sir JOHN FLOYER relates; he could protract his fit by denying himself rest:

" *[*] I have found, that by late sitting up I a
" put by the fit for a night or two; and I have
" found it commonly necessary to rise out of bed
" especially in the summer time, and to sleep in a
" chair the first night of the fit. Two nights
" before the fit Asthmatics want sleep frequently."[†] The fit threatens to take place two or three nights before the attack, but the voluntary power continuing to aid the involuntary power, this crisis is put off at the expence of sleepless nights, until the cause has proceeded to its *acmé.*

The same power is exhibited in Epilepsy as in Asthma. A young man has been affected with Epilepsy from the age of thirteen to nineteen: it most frequently makes its attack in his sleep, but before his senses are gone he perceives it. If his sleep be profound, and the head affected in the very first instance, he cannot stop its progress, though he has a confused sense of his situation; but sometimes he has a sufficient warning by a numbness in his right hand, a tingling, or a pain, and in this case he starts from his imperfect slumber, and using exertion of his muscles, with attention of mind, he can succeed in stopping the fit, even after the attack is begun. This instance of Epilepsy is marked with irritation in the stomach; a load of viscid phlegm is found to oppress that organ, and strong emetics have occasioned its evacuation in large quantities, with temporary relief.

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[*] Treatise on Asthma, page 94.

[†] Ibid. page 94.

But the paroxysm of Asthma does not always come on in sleep, for after frequent attacks, a period of return is introduced into the habit, which becomes part of its œconomy, and is too powerful to be counteracted by preserving the aid of the voluntary power during the night. Here the same force of habit operates which influences disorders of the body in other instances, even after the cause which first excited them is removed.

The *Diabetes* in this species of Asthma may be properly attributed to the Hydropic Diathesis of the body, in which an effusion from the exhalents of the kidnies may be reasonably expected to accompany a similar effusion from those of the lungs.

It appears also, that the arterial exhalents of the kidnies may be relaxed by the sudden impression of passions of the mind, as may be the case in Hysteric Asthma.

The tendency to discharge copiously watery urine, accompanies more or less all the varieties of Asthma which make their attack periodically. The kidnies receive nerves from the intercostals, and we are led to a supposition of strong association of actions in the kidnies, stomach, and lungs, from the sympathy thus established.

The diabetic discharge does not, however, appear to afford relief to the lungs in the paroxysm of Asthma. If it were useful, it would still confirm the pathology here delivered; but it precedes or accompanies the paroxysm instead of following it. It continues whilst the exacerbations last, and is reduced to a healthy standard when they finally cease, the balance between exhalation and absorption being then generally, as well as locally, restored to the vessels of the body.

In support of this reasoning, we find that the hydropic diathesis cannot be concealed in the advanced state of this species of Asthma; for, by the testimony of every medical authority, it terminates very frequently in anasarca.

But before that species of Dropsy comes to be suspected, the exhalents of the kidnies permit the passage of great quantities of water, which, for some time may prevent the effusion in the cellular membrane, or cavities of the body. Thus does Asthma connect itself with Dropsy by this intermediate link, as well as by the effusion into the air cells of the lungs.

Though this symptomatic affection be in general temporary, yet its frequent recurrence with a degenerated condition of the fluids, have often made it permanent, and, by the testimony of M. SAUVAGE, induced a true Diabetes.

I have not seen the diabetes mellitus as a symptom or an effect of Asthma, but the state of the stomach is so much connected with the diabetes in this disease, that I believe the flow of urine depends greatly on the condition of the digesting organs, and the chemical assimilations which are there formed. (See Dr. ROLLO on the Diabetes Mellitus.)

The *Straitness of the Breast*, or that sense of uneasiness which has acquired the term, must be augmented in proportion as the close application of oxygen to the pulmonary vessels is diminished. M. LAVOISIER has proved that of the oxygen which disappears in respiration, *four-fifths* are consumed by a combination with the carbon of the blood, forming carbonic acid gas; the remaining *fifth* is either absorbed by the blood, or, uniting with hydrogen, discharged from the blood, forms aqueous vapour.

It is also beyond a question, that a principal duty of respiration is to impart heat to the blood, and to furnish it with the quality which oxygen possesses, of stimulating the heart and arteries to more vigorous contractions.

Now Dr. GOODWIN shews, by his experiments, that a fluid in the air cells, introduced in the act of drowning, is an important obstacle to the union of oxygen with the blood, and that it frequently prevented the influence of its stimulus, by the efficacy of which the contractions were to be restored, in suspended animation.

Can we then wonder that the Asthmatic should eagerly desire an open exposure and a change of air, since the condition of the air cells, filled more or less with serum, opposes that ready combination of oxygen with the blood, by which a proportionate degree of vigour would be required?

We have, therefore, experiment in support of the cause here asserted, of some of the most remarkable symptoms which distingush Asthma. Serum in the air cavities of the lungs may be productive, by its bulk, of uneasy sensation; but, considering its influence more widely, it may be the cause of deficient contractions of the heart; the blood will then be longer delayed in the ventricles and pulmonary vessels, but particularly in the right ventricle; the current through those vessels being rendered difficult by the compression: hence *Polypi* have so often been discovered in the cavities of the heart and large vessels of asthmatic subjects.*

The patient may also, from this condition, be affected with *Syncope* and *Irregularity of Pulse.* The irritability of the heart being unequally excited, at one time, its contractions may be languid, because the blood may then possess a less stimulating property; but occasionally they may be energetic and strong, from its feeling the excitement of a greater distention, and of a more stimulating fluid.

The *Intermitting Pulse,* which FLOYER attributes to the constriction of the arteries, by circumvolving nerves, may more probably proceed from this condition of the heart.

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* See Part I. Sect. III.

There is also said to be a strong sympathy between the stomach and the heart, in which case the latter may be greatly influenced by Dyspepsia, so prevalent in Asthma.* The eructation of flatus uniformly gives relief, and where the pulse has intermitted, this discharge frequently restored a regular action of the artery.

Spitting of *Black Mucus* is a symptom often occurring, but not invariably, in Asthma, as well as in the pituitous consumption.

Amongst the signs affording a prognostic of Consumption, MORTON mentions the expectoration of black and viscid phlegm in a morning. He tells us, that it proceeds from the glands near the windpipe being filled with a black humour, a symptom common to scrophulous and scorbutic subjects, and indicating the probable consequence of Asthmatic Consumption.†

But these glands have not been discovered to communicate with the cavities of the windpipe or bronchia, and the mucus is therefore not coloured by their contents.

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* Vide Zoonomia, Vol. I. Sect. XXV. also 23, 4, and 35, I. 4.
† Phthisiolog. lib. ii. cap. ii. 10.

Yet they have been found, upon dissection, filled with black matter. By the testimony of MORGAGNI, in three bodies out of four which he examined with this object in view, the black colour was diffused through the glands; and paper being rubbed over the dissected portions, received a sooty tincture, not different from that of powdered charcoal diluted with a good deal of water.

He however denies, that the black mucus which is said to be expectorated in certain cases can have had a natural excretion into the trachea or bronchia, from these glands, but allows, that erosion in disease may possibly have opened a passage.* It is not necessary to say, that erosions do not exist in the cases now the subject of our inquiry.

There is, therefore, an expectoration of black mucus, which could have no other source than the exhalents of the air cells, or the glandules which open into the trachea and bronchia; and there is also a similar black appearance in the bronchial glands which are not connected with the air cavities. It is also observable, that, by MORTON's testimony, scorbutic habits are very liable to the symptom, and that it leads to Asthmatic Phthisis.

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* Morgagni de Causis et Sedibus, epist. xxii. art. 21.

Dr. WILLIS remarked, that some patients had frequently in the day, but particularly in the morning, "Sputum instar attramenti ni-"gricans."*

FLOYER† describes this symptom as belonging to the Hysteric Asthma, as well as to the Periodic, and as giving the appearance of feathers; and Dr. WITHERS had observed it in many cases.‡

I have frequently remarked an expectoration of black mucus in Asthmatics, when there could be no suspicion of the rupture of any small vessels. I believe the material which colours the mucus to be the carbon of the blood, which in the healthy state of the system was exhaled in carbonic acid, the atmospheric air having been then properly decomposed.

The habit of an Asthmatic is generally dis-

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[*] Willis Opera, Vol. II. de Phthisi Pulmonali, p. 49.

[†] Treatise on the Asthma, p. 11—19.

[‡] Withers's Treatise, &c. p. 8.

tinguished by cold extremities; and Dyspepsia is accompanied with watery blood, and weak contractions of the muscles. A predisposition appears in these circumstances favorable to the opinion that in Asthma the system is not sufficiently invigorated with oxygen, a conclusion to which we are also led by the state of the lungs, particularly noticed in this Inquiry.

But by whatever means the predisposition to Asthma may be acquired, hydrogen holding carbon in solution predominates in the system, and gives to the arterial too much of the colour and quality of venous blood.

An expectoration of this kind may therefore be expected when a very considerable extent of the vesicular surfaces is covered from the contact of air by a coat of serum: but that predisposition of the blood, which leads to the pituitous Consumption as well as to Asthma, may at all times favour the appearance; and, according to the testimony of MORTON and WILLIS, the effect occasionally takes place in both diseases. In the species of Consumption called *pituitous*, there are contra-indications, which, in its commencement, will not allow a certain prognostic of which disease it may finally bear the character—of Asthma or of Phthisis.

When the mucus is not black, it is sometimes pellucid, at others yellow, in proportion to the time it has remained in the follicles of the trachea or air cells previously to the discharge. If it be tinged with blood, it is apparent that the capillary orifices are so dilated as to permit red globules to pass. If it have a saltish or sweetish taste, there must have been some blood in the mass, and more heat than generally prevails in the lungs of Asthmatics; and it is probable that spittings of this kind proceed chiefly from the follicles of the trachea having been affected in some degree with catarrhal inflammation.

Sleepiness comes on sitting, but not leaning backwards, according to FLOYER. This is in the *acmé* of the paroxysm, when the oppression of the fluid is most considerable. In this state a reclining posture would make the inspiration of air more difficult, because the stomach and lower viscera would press more against the diaphragm, than when in their depending situation.

The necessity of an erect attitude is also owing to the passage of the blood through the pulmonary artery being obstructed, and thus occasioning plenitude and delay in the right ventricle, and in course an opposition to the free entrance of venous blood from all parts of the body into the heart: in this state of the ventricle and pulmonary vessels, a reclining posture, by impelling the circulation towards the heart, must increase the anxiety, the straitness, and the suffocative sensation at present subsisting; sleep will therefore be more opposed by the exertions of voluntary power to preserve respiration and life, than it will be promoted by the fulness of the veins of the head, and the debility and languor of the habit; which causes might produce lethargy, if a more powerful instinct did not avert their effect.

The *Pulse* of an Asthmatic is generally feeble; as the fit approaches, a temporary increase of fulness and strength may be sometimes perceived in young subjects; but this indication is not to be depended upon; for, in the progress of the paroxysm, weakness succeeds, with increased frequency, but the pulsations seldom exceed ninety in a minute.

When the pulse is most frequent the mouth is moist, and there is often a whitish mucus upon the surface of the tongue. Thirst seldom attends either in the paroxysm or in the intermission.

The *Urine* is very pale and copious before the fit, and during its progress; it is also frequently copious and pale when the fit does not come on, in consequence of indigestion, to which the Asthmatic is always liable. When the fit goes off, there is no remarkable deposition in the urine; but it is generally in less quantity than is natural to health. If the urine be copious and pale, it is, I believe, never sweet.

In consequence of the remark of SAUVAGE on Diabetic Urine, the water of an Asthmatic has been examined more than once, but it was always found to be weak, saline, and without saccharine matter.

The *Belly* of an Asthmatic is seldom regular: when it has been so by custom, I have generally found that it was lax. If the patient is bound in his body, it probably induces a fit; but this constipation generally alternates with diarrhœa, and both conditions may be attributed to the dyspepsia of the first passages. An obstinate constipation is frequently the sign and effect of a torpid state of the liver.

There is, at the access of the fit, a remarkable action of the abdominal muscles, and of all the muscles which are in common use for the discharge of fæces. The patient finds it impossible to resist the impulse, and before he has much experience he flatters himself that the evacuation will be followed by relief.

This effort to expel the contents of the bowels may be excited by their acrimony, and occurs most frequently in the third species; but the muscles which are subservient to the discharge being employed in the act of respiration, it may not be distinctly known where the cause resides, in the lungs, the stomach, or lower bowels: the result may, however, shew, that all these cavities have been offended; that only the stomach and bowels have been irritated, in which case the fit may be short;* or that the air cells of the lungs have been chiefly oppressed; and then the fit proceeds in a more regular manner, and terminates with expectoration of mucus to great certainty.

It has been observed, that a sense of heat prevails sometimes in the paroxysm, affecting mostly the trunk of the body; but the temperature is, notwithstanding, low; nor does this perception so often occur as that of coldness.

The *Habit* of an Asthmatic is generally cold, with the occasional exception of a short interval in the access, when there is an increase of effort in the arterial circulation, which does not continue long. Dyspnœa is not so likely to be marked with this prevailing symptom, as the regular form of Convulsive Asthma.

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* See Sect. 13, on the Third Species.

If the bulb of a thermometer be put into the mouth of an Asthmatic, at the approach of a fit, the temperature will be found lower than in the intervals. In the height of the fit I have found the heat of the exhaled vapour confined to the cavity of the mouth, at eighty-two of Farenheit, when the same subject had, the day before, proved the temperature, by this test, to stand at ninety-seven.

Three hours before the death of an Asthmatic, the temperature within his mouth was reduced to seventy-three. I have often applied the thermometer, but it is impossible to know with how low a temperature a patient may recover.

If the stomach be full or empty, the inconvenience in the paroxysm is almost equal; at least, nothing can exceed the distress which the patient feels from a perfect emptiness of that organ, occasionally, after the remission has commenced, and exercise is tried. If the stomach be loaded during the debility which it suffers in the paroxysm, the consequence is sufficiently manifest: the middle road should carefully be pursued.

The Asthmatic may suffer many or few fits in a certain time: **Floyer** sustained thirty-six in the year; but some of these must have been of very short continuance, probably excited by indigestion, and terminated when the stomach was relieved; for it is allowed, that, after repeated attacks, the habit of convulsive contraction of the abdominal and intercostal muscles will be so confirmed, that convulsions may take place from trifling causes.

He observed, that the Periodic Asthma was regular once in ten days; but that the Continued Asthma was uncertain. When the paroxysm has come on so frequently as once in ten days, I have usually remarked, that considerable Dyspnœa has remained between the fits: and it always may be depended upon, that the longer and the more perfect an intermission is, when the genuine Convulsive Asthma is established in the habit, the more violent will be the paroxysm.

The *Mind* of an Asthmatic is impatient, and he suffers much from opposition to his method of management in his own case. After several returns of the disease, he has learnt modes of comfort and satisfaction, which the anxiety of his friends may impede, rather than promote, by their solicitude and attention: he, therefore, is irritable during the fits, and with difficulty restrains his disposition to petulance. But, excepting in the exhausted habit, vivacity, and good humour never fail to return with the freedom of respiration.

It may be observed generally as a fact, that the mind of an Asthmatic is more susceptible of generous and grateful feelings than that of any other invalid, subject to a chronical disease equally obstinate.

The *Respirations* in the paroxysm are more numerous in a given time than in health; a fact which stands in direct opposition to the authority of FLOYER. I have reckoned from twenty to forty respirations in a minute, but they never exceed thirty without a very considerable increase of frequency of pulse, and a well-grounded indication, that the case is complicated with some inflammatory affection.

In simple Spasmodic Asthma, however, the respirations are more frequent than in due proportion to the contractions of the heart: it is, therefore, extraordinary, that FLOYER should suggest a contrary state, which is not supported by any authority, except that of ZECCHIUS, which he quotes: in opposition to which WILLIS describes the respiration as "*crebra et anhelosa*;" and Dr.

STARK observes, that patients in this disease commonly breathe " *thirty* or *forty* times in a minute, " and still oftener after eating, or the most mode- " rate exercise."*

I hope the cause which immediately occasions a paroxysm of the *First Species* of Asthma has been sufficiently explained. We shall proceed next to the remote causes which support the doctrine here delivered, as they naturally lead to the condition described in the preceding sections.

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* Stark's works, p. 43.

SECT. X.

REMOTE CAUSES OF CONVULSIVE ASTHMA.

PREDISPOSING CAUSE.

The Periods of Life.—The sex.—The temperament of Body.—Dyspepsia.—Its consequences.—Effect of Dyspepsia on the circulation and secretions.—General Debility of the solids.—Condition of the fluids.—Sensibility or irritability of the habit.—Lymphatic absorption cursorily considered.—Its importance in the animal œconomy.

In pursuing our inquiry into the remote causes of that serous effusion in the air cells of the lungs which has been described, we find a condition of the body which makes it liable to be excited by circumstances internal and external. This is a *Predisposition* to Asthma; and those circumstances which are sometimes internal, but generally occur from without, are *exciting causes* of the fit.

The *Predisposition* is, of all the remote causes, most important, and claims particular attention.

HIPPOCRATES * attributes to youth a state of habit ready to suffer hæmoptysis, inflammations, and fever; beyond this period the constitution is liable to be attacked by peripneumony, lethargy, and Asthma. In advanced age difficulties of breathing, &c. come on, but this writer applies the word ασθματα to that constitutional affection which he assigns to manhood in the 30th aphorism, and δυσπνοιαι to that of old age in the 31st. And he also in the 26th aphorism includes ασθματα amongst the affections attacking the body in the period before puberty.

The affection signified by ασθματα in this place is again attributed to puerile habits in another † by the same word.

Infancy and manhood were therefore esteemed by him, the periods of human life predisposing to this disease; old age makes the habit less irritable, and therefore less likely to suffer the strong convulsive contractions which may attend the other stages; but it does not follow that the contractions of the respiratory muscles are not convulsive in old age, if difficulties of breathing, or δυσπνοιαι affect the subject, in consequence of excessive moisture offending the lungs.

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* Hippocrat. Fœsii Aphor. 29, 30, 31, lib. iii. sect. 7.

† Liber de Aere, Locis et Aquis, Fœsii, tom. i. p. 281.

We have no alternative in speaking of the nature of muscular contractions, which must be considered convulsive when they exceed the common purposes of healthy respiration: nor can difficulty of breathing be characterized precisely in any other manner, than by the proportion of contractions which these muscles undergo; though it may be allowed that a particular energy, which is not often to be expected in old age, is essential to the character of the Convulsive Asthma of Modern Nosology, which is so far supported by the authority of the Greek Physician.

Men are said by many writers to be more generally affected with this disease than women, which may probably be the case, because the female sex are not so much exposed to the application of exciting causes.

The *Temperament* which predisposes to Asthma is the *choleric*, as described by Professor GREGORY[*], but it seems to derive its influence in this respect, from the disorders of the first passages to which it is liable.

Persons of this temperament are more subject to accumulations of blood in the pulmonary vessels, and to be affected by sudden impulses of anger and emotion of mind, which readily occasion an increased impetus in the circulation, overpowering the contractile tone of the exhalents. They have also too active a secretion of bile, which may occasion irritation and heat in the stomach and duodenum, as it certainly is frequently the effect of high passions and a luxurious life. If to this state be super-added Dyspepsia, the choleric temperament will be more subject to the exciting causes of Asthma than any other, and may be more generally observed to be liable to its attacks.

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[*] Conspectus Theoriæ Medicinæ, 929.

Wherever Dyspepsia prevails, there shall we find a fruitful opportunity of exciting the paroxysm of Asthma. If it exist unaccompanied by other remote causes, it may be said to occasion the Third Species; but this debility of the stomach must probably concur with other causes before the disease appears in the form of the First Species.

After it has long had possession of the first passages, the proper nourishment of the body will be considerably impeded, and the solids being weak, the fluids will be watery and poor. The temperature of the habit is then low and unfriendly to the effecting of new chemical affinities, by which oxygen and heat are imparted to the system. A morbid state is then productive of new disorder, or it may be said, that predisposition is more confirmed, and more rapidly approaches the point to which it tends.

In this condition of the habit the stimulus of the blood will not excite the heart and arteries to vigorous action; the exhalents will not contract with healthy irritability, and an over proportion of water in the blood will make the exit of serum through their orifices more easy and copious.

There is besides, a mechanical effect from this relaxed state of the first passages, which may suddenly induce the proximate cause of Asthma. The stomach may be so distended as to fill a very considerable space, which should be allotted in inspiration to the descent of the diaphragm: at the moment when that muscle is excited to contract its fibres and become plane, that the lungs may be filled with new air, the bulk of the stomach may thus prevent the exercise of this function. The progress of the blood to the left side of the heart is then delayed in the pulmonary vein. The capillary orifices of the artery are so dilated to relieve the branches of that vessel that a critical escape of serous fluid ensues. This occurs in vessels which have coats not thin and tender, which predisposes to Phthisis, but relaxed and dilatable, which is part of the predisposition to *this species of Asthma.*

By this distention farther inconvenience follows, of the same kind; other vessels are probably compressed, and the Diabetes is produced. The duodenum and more remotely the whole canal, suffer from the vices of the first digestion.

The motion of the blood is promoted both in the arteries and in the veins, by the action of contiguous muscles. The blood returning to the heart by the Vena Cava and its branches, is driven forward by the action of the heart and arteries, and also by the contraction of muscles which press the veins. Pressure, from these causes, and subject by the rules of muscular contraction to alternate relaxation, must determine the blood towards the heart, because these veins are supplied with valves which prevent its progress in a contrary direction.

The lymphatic vessels, more numerously provided with valves, have their action increased by the same causes. When, therefore, we consider the want of energy in the heart and arteries, and the irregularity of the contractions of the visceral muscles, in Dyspeptic patients, we must allow that there is a sufficient cause for a slow progress of blood in the veins, and for the consequent turgescence of the arteries which secrete the urine, or which rather permit the thinner part of their contents to pass off in quantities proportioned to the necessity of relief.

The Vena Cava passing through the Diaphragm, the free motion of that muscle materially influences the return of the blood to the heart, and the circulation being impeded in the liver, from the languor of the vessels which are to carry off the blood, hydropic effusions may follow* in other cavities besides those of the lungs; accordingly, we observe Dropsy of the Belly and cellular membrane to follow Asthma from this mechanical cause, as well as from others that are well known.†

This Dyspeptic state of the stomach is so prevalent in a great majority of cases, that it is difficult to separate it as a predisposition or symptom of the disease in considering all. We may justly call it the cause of *one species*, but it will be found that none is clearly unconnected with flatulence, which, without any certain exception, makes part of the paroxysm, or precedes it.

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* Vide Hoffman, tom. iii. sect. ii. cap. 2. p. 98, necnon, tom. iv. Cons. et Resp. Med. Cent. 1. Casus XCIII.

† See Dr. Saunders's Treatise on the Liver.

Sir J. Floyer considers this state of the stomach as secondary to the state of the lungs, and not as an immediate cause, but the contrary order is more probable, since Asthma seldom appears without having been preceded by Dyspepsia, though the latter frequently occurs unconnected with Asthma. The power of digestion will certainly be additionally weakened whenever Asthma is formed, and in this view Dyspepsia may follow Asthma; but it has previously been a cause of the disease, which reciprocally augments and is itself aggravated by, this debility.

This must in time be the opinion of every observing Physician if he carefully attend to cases of Asthma, and reflect on the results of his experience. But hitherto it remains a fact not creditable to our science, that the authority of Floyer making Dyspepsia in all cases a symptom only, and not a cause of disordered lungs, is maintained in the practice, however ineffective, of most Physicians.

Floyer remarks, "notwithstanding this opinion, "that a short fit is accompanied only with wind "and spitting, and depending on disorders in

" diet, &c. and this was his Asthma before it settle
" into periods."[*]

The œsophagus was found by Dr. HALES very dilatable with a small force of water or wind,[†] which leads to a conclusion that Dyspepsia may frequently distend the whole canal, and that it may produce wheezing where there is no obstructing mucus in the air passages sufficient to create that symptom. Flatulence may force the sides of the œsophagus against the trachea, compressing the cavity of that pipe into a smaller area.

HALES attributes the occasional vertigo of dyspeptic patients to the presence of Flatus in the œsophagus, compressing the descending aorta, and by this means, impelling the blood for the instant towards the head.

The increase of bulk which an Asthmatic may occasionally experience from this cause, will be in proportion to the quantity and according to the quality of the aliment which has been taken, some substances containing a greater portion of fixed air than others; which air must be separated by heat and fermentation, the natural consequence of delay in a weak stomach. Pounded apples give out 48 times their own bulk.* A light atmosphere, discovered by the sudden falling of quicksilver in the barometer, may add to the influence of these causes by the compression on the ingesta being diminished.

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[*] Floyer, p. 12.
[†] Statical Essays. Vol. II. p. 183.

Dyspepsia, as a symptom of Retrocedent Gout, Exanthemata, or Ammenorrhæa, may become an obstacle to the freedom of respiration whilst it continues; but the relaxed solids and watery fluids are not a part of its consequences, when it proceeds from these causes. The idiopathic disease arising from a loss of tone in the muscular fibres of the stomach, may have depraved the digestion for any length of time, and general debility will be increased in proportion.

The hydropic diathesis may be expected to follow Convulsive Asthma, and if this effect be not discovered so often in the lungs as in other cavities, this organ owes its greater security to the incessant activity of the lymphatic vessels, and of those respiratory motions which assist absorption, in removing by vapour the increasing fluid. We have a dependence on these powers in proportion to the importance of the function to be preserved by their combined efforts.

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* Vide Dr. Hales's Vegetable Statics, p. 208.

In the paroxysm the surface of the body is universally pale, and the muscles appear shrunk. The weakness of the heart and arteries, and a predisposition of their contents to the character of venous blood, because oxygen is deficient, sufficiently account for both symptoms.

In this state of the blood we need not apprehend worse consequences than usually occur in the disease. Mr. KITE has proved, " that the left " sinus venosus, auricle and ventricle, do not " cease to contract in consequence of the phlogis- " ticated state of the blood in their cavities."* Examples have been given in Sect. VI. of different degrees in the danger of the patient. In some subjects, whose habits had little irritability, the effusion was too oppressive to be discharged; in others, life was preserved with difficulty, after the balance had been long kept with great uncertainty between death and recovery. In these instances, effusion of serum had been sudden and extensive, excluding the further penetration of oxygen into the vessels, but life was still preserved, till the irritability of the system being exerted with energy, the bar was removed.

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* Mr. Kite's Essays and Observations on the Submersion of Animals, &c.

Though the blood have too great a proportion of carbon and hydrogen, yet we must not attribute the disease to this cause, without considering the state of the body which may occasion it. Oxygen exists in so large a proportion as a component of the atmosphere, that a deficiency of it in the blood must be principally owing to a peculiar derangement in the machine.

The habit of an Asthmatic is affected, by apparently small impressions on the nerve or fibre, whatever name this disposition may have obtained; Mobility, Irritability, or Sensibility. The robust are unaffected by impulses which the feeble or delicate, and particularly the Asthmatic may acutely feel.

This predisposition is likewise more perceptible at one period of life than at another. It decreases with the progress of years, and is almost lost in extreme old age.

It is as well described by the term *Irritability* as by any other, and may be most clearly seen in the facility with which Convulsive Motions, after having been once excited, run into excess, or, which having subsided with their cause, are liable to return, upon much inferior occasions, and even in some instances without a perceptible exciting cause.

Without this remote cause in our view, the spasmodic contractions cannot in some cases be accounted for, and it seems always to attend or precede Convulsive Asthma from the irritation of mucus. This offending matter may be removed from the lungs, but whilst the predisposition remains, the disorder cannot be said to be cured.

It may be suggested, that the serum collected in the air cells, may be partly occasioned by a paralytic state of the absorbents. A temporary weakness of these vessels is very probable, but the Pathologist must be unwilling to rely on the frequency of such a condition, because Providence has, doubtless, designed them to relieve the disorders which may occur to every other branch of the animal system.

If then, we are to consider a paralysis of these vessels as a cause of the accumulation of fluid in the air cells, and of the diabetes which attends it, we must suppose a condition not likely to admit of that relief which so periodically supervenes in Asthma. If we suppose the rupture of a lymphatic branch, we infer a fixed cause of continued Dropsy; and if a spasmodic constriction, the case is too uncertain and capricious to reason upon, and may so commonly occur, as to stand in opposition to the design of the lymphatics, whose office is that of the last guardian of the safety of the animal œconomy.

That the absorbing vessels are essential to the preservation of the air cavities of the lungs from obstruction of every kind, must be concluded from their great number dispersed in the pulmonary system. " Next to the liver," says Mr. CRUIKSHANK, " the greatest number of absorbents " have been found in the lungs."* Dr. HALES says, the velocity of the blood in the lungs is many times greater than in most other parts of the body. A *remora* in any of the vessels of this organ, will therefore be in proportion, more productive of uneasiness than in any other; and an effusion from the exhalents, or the rupture of the vessels, according to the habit of their coats, will be a more likely consequence of a free return of blood from the right side of the heart to the left being obstructed, and may take place sooner than in any other vessels where the velocity of the blood is less, though those vessels should be equally obstructed; therefore effusion in the air cells must perpetually demand the absorption of the lymphatics of the lungs, and unless that function maintains its healthy vigour more generally than a theory of paralysis or constriction will support, Asthma must be a more frequent disease than we find it, and be much more fatal in its result.

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* Anatomy of the Absorbents, p. 196.

SECT. XI.

THE REMOTE CAUSES CONTINUED.

THE EXCITING CAUSES.

Alterations in the density of the air.—Effect of unusual rarity. —Oxygen united to the blood in greater proportion as the pressure of the atmosphere increases.—The rarity of the air on mountains and in elevated countries.—An animal destroyed by the exhaustion of air.—An animal exposed to accumulated density of air.—Lightness of air with moisture, and with heat and moisture.—The heat of summer and autumn. —Effect of evaporation from surfaces.—Cold.—Cold and moisture.—Easterly and North-easterly winds.—Rain, snow, storms.—Active exercise in warm air.—Dissipation of heat. —The asthmatic months of August and September.—Frosty weather.—The advantage of Frost.—Evacuations of blood. —Violent purging or vomiting.—Inanition.—Accelerated circulation.—Suppression of evacuations.—Repulsion of exanthemata and gout.—Dust in the air.—Metallic fumes.—Smoke of Tobacco.—Smells.—Fixed air.—Passions of the mind.—Changes of the moon.—Errors in diet.

The influence of the air may not produce any evident effects upon the habits of a nation or body of men generally, but changes of the atmosphere, may, doubtless, occasion alterations in the health of particular subjects, who may from this cause suffer paroxysms, or enjoy remissions of diseases to which they were predisposed. In all disorders of respiration, whether febrile or not, this truth is confirmed by experience. In *pertussis* it is particularly remarkable, but not more so than in Convulsive Asthma. Sir John FLOYER lived in Oxford twelve years, during which time he had little distress from his complaint; but he never visited Staffordshire, his native air, without suffering a severe paroxysm or two. An Asthmatic, whose case will be related, for several years after the establishment of his disorder could not stay a day in the place of his birth and residence during his childhood, without experiencing the same effect, though the disease began in a different situation, less favourable to its production.

The atmosphere may affect the Asthmatic by several changes. When the mercury in the barometer stands as high as thirty inches, the density of the air is sufficient, *cæteris paribus*, to preserve the intermission of his disorder; and alterations from this standard to a lower, will be proportionally unfriendly. Besides the variations in the degrees of density, the air may be cold or warm, cold and moist, or warm and moist; and rain, snow, or frost, storms and fogs, may give additional inconvenience, but slight in comparison with the relative degrees of rarity or density which occasion such appearances.

The observations of **Floyer** on the influence of density, or rarity of air on the Asthmatic, are well founded. During a dense state of the atmosphere, acrid miasmata, effluvia, and vapours being suspended high, are not so likely to irritate the pulmonary membranes: at the same time these causes will not so much offend patients subject to Asthma of the present species, as they will affect those subject to the second species, whose sensibility may be only equal, but whose pulmonary membranes are more naked of the natural defence of lymph.

Vapours are, however, accused in all sorts of Asthmas, without any reflection on the impunity with which many Asthmatics inhale the atmosphere of London and Holland, where the advantage derived from the density and pressure of the air may more than balance the offensive inconvenience of fog, and various animated filth, which, from its quantity, and incessant supplies, is always floating and being inspired. This consideration offers new evidence of the neglect of discriminating the causes of this disease that has hitherto prevailed.

In higher situations, impurities of the air are a more sensible exciting cause of Asthma, or it may be more accurate to say, that when vapours hang low in these situations, we have a more certain index of the diminished density of the air, which would otherwise carry them off; and that the cause of their low suspension is really a state of atmosphere, which, from the elevation of the land must produce, at the same time, the disorder of respiration.

It may be said upon the same principle, that a dry and settled atmosphere is friendly to the Asthmatic, not only because it is free from impure vapours, but also as it has more elasticity and weight to press upon the air cells of the lungs.

According to the state of the atmosphere the combination of oxygen with the blood is rendered difficult or easy. The soft and thin membrane through which it is absorbed, has frequently, in its natural state, been shewn to admit of the penetration of elastic fluids. The predisposition in Asthma appears however to be unfriendly to their union with the blood, and changes in the atmosphere may more materially obstruct it.

The usual density of the air being lessened, a certain volume will not only possess less weight, and press less against the membrane, but it will also contain less oxygen to enter into the new affinity. Where the heat of the body so much promoting the process was before diminished, this sudden rarity may be a powerful exciting cause of the Asthmatic paroxysm.

A certain quantity of oxygen is consumed in less time, in the respiration of air, which makes a greater degree of pressure than in that of air, which gives but little pressure. Under the *greatest* degree of pressure, which was made by an admirable chemist, the oxygen was consumed in less than half the time that was required for this effect under the *smallest,* although the excess of the former above the latter, was much less than that which men experience in the common changes of weather.* If we reflect upon this circumstance, we must conclude, positively, that oxygen enters the blood vessels, contrary to the opinion of Dr.

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* See Minutes of the Society for promoting Philosophical Experiments and Conversation.

Crawford, and that pressure considerably augments its penetrating force.

The objections which have been made to the accounts of hæmorrhages having been occasioned by the great rarity of the air on high mountains, though ingeniously supported by experiments, cannot overturn the plain fact, of considerable disorder of respiration having been repeatedly experienced from this cause; though it is not to be supposed that concurrent causes existing in the habits of the persons affected, or in greater proportions of unrespirable fluid, may not occasionally operate in these regions. The pressure of the external air upon the human body is estimated at 32,000 pounds weight in some states of its density, in other states it is supposed to be reduced to half that weight.

The subject has been more accurately handled than is here necessary to specify: the morbid alterations in the animal body, which are produced in consequence of the changes in the weight of the air, are more the object of this Inquiry.

An animal killed by exhaustion of air under the receiver of an air pump, has the right side of the heart and veins greatly distended with blood, and the left side almost empty.

An animal of equal vigour placed under a magazine of a condensing machine, will bear an increase of density of three or four atmospheres. The former aminal expired in two minutes, the latter remained a quarter of an hour at a time, without any material inconvenience, and appeared to suffer most from returning to his customary medium of greater rarity.* In the first experiment the equilibrium was destroyed between the external air, and the air circulating with the fluids in a fixed state, which therefore expanded. This state the muscles of inspiration could not overcome, and the lungs being forced into a state of expiration, the blood could not be passed to the left side of the heart, from the collapse of the vessels.

In the second case, an excess of air merely effected a more perfect and durable expansion of the cavities, and thus facilitated considerably the passage of the blood to the left side of the heart,* doubtless affording at the same time increase of vigour and stimulus to the actions of that organ.

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* Mr. Kite on the Submersion of Animals, p. 50, &c.

M. de SAUSSURE had proof of the inconvenience to respiration, from great rarity of air, on the top of Mont Blanc, the mercury in the barometer at the same time standing at little more than half the height which it stood at in the plain below. Sir W. HAMILTON experienced similar difficulty of respiration on Mount Ætna, which he attributed to the rarity of the air, distinct from sulphurous vapour. Oxygen has been found in less proportion, as a component of the atmosphere in these high regions, than in the lower, which is an additional cause of disordered respiration.

If to the lightness of the air, *moisture* be added, its influence may be more injurious, and has frequently been felt to be so in various situations, when the predisposition to Asthma was not present. This constitution of the air excited the disorder of respiration, treated of by Dr. MILLER under the name of Asthma.

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* Mr. Kite, p. 52.

Heat and moisture appear to influence the density of the air more than philosophers had conceived, before the observations of M. de SAUSSURE, jun. appeared.* The effect of these is felt by other valetudinary subjects of relaxed fibre, as well as by the Asthmatic, but by none more than the latter.

In *summer* and *autumn* the atmosphere is rare, and so far hostile to the Asthmatic, but to lessen this inconvenience, he enjoys the grateful sense of a warm skin, and general perspiration, as the circulation is determined to the surface more than in the colder months. If it were not for this diversion in favour of the lungs, he would perceive much more of his complaint than he really does in the warm season, for many circumstances operate against him then which do not in winter. The exhalation from the pulmonary vessels, occasionally increased by exercise or other causes, will oftener be profuse in the hot months, and be more suddenly followed by the coldness, which is known to come upon surfaces, in proportion to the evaporation made from them.

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* Journal de Physique par M. L'Abbé Rosier, Tome xxxvi. Memoire sur la Densité, &c. p. 98.

In the opinion of some writers, cold, occasions this disease.* *Cold and Moisture* check cutaneous perspiration, and diminish the heat of the lungs; there is, therefore, additional fluid circulating to the pulmonary exhalents, and there is less expiration of vapour in breathing. It is said that the skin may even be changed from a perspiring, to an imbibing state, occasioning an excess of water in the vessels. We have, therefore, in this state of the atmosphere, an exciting cause of Asthma, as frequently as in that of moisture with warmth. Cold alone will sometimes but not commonly excite the paroxysm, for there may be states of the atmosphere inducing great torpor on the pulmonary exhalents, without the presence of aqueous vapour, or moisture.

The *East and North-East Winds,* are so piercing, as to overcome the beneficial influence, which coldness, simply united with density of air, would have on the respiration. These penetrating winds have been shewn to be more active causes of evaporation from surfaces than great heat alone. They are therefore felt *intus et in cute,* by all persons of lax fibre, and sensibility of nerve, whilst a frost is in itself friendly to the Asthmatic.

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* Ryan observat. on the History and Cure of the Asthma.

The east and north-east winds not only chill the lungs, making their capillaries incapable of contracting on their contents, but they check cutaneous perspiration, inducing another cause of Asthma by this matter being turned upon the lungs. Why the cutaneous capillaries are constricted preceding their torpor, or in consequence of it, whilst the pulmonary capillaries are affected with torpor and dilated apertures, can only be satisfactorily explained by recurring to the predisposition of an Asthmatic subject; at the same time allowing the fact, that even when this predisposition does not exist, perspiration suppressed on the skin, will always find an exit from the pulmonary capillaries, or from those of the intestinal canal, unless an acute fever supervene, from every passage being equally obstructed. This is proved by the moist expectoration of a mild catarrh, and by gentle diarrhœa from taking cold. In the Asthmatic subject fever does not readily come on, and the pulmonary vessels being weaker than those of the rest of the system, the flux is discharged from them.

Changes to rain or snow affect the Asthmatic, because of the decrease of weight in the air, which gives occasion to those alterations. Storms of any kind are usually attended with a sudden rarity of the atmosphere, and according to the prevalence of excessive heat or cold accompanying the change, the Asthmatic will be more or less affected. Sir J. FLOYER observes, with justness, these effects, but he attributes too great consequence to the influence of matters floating in the air, apparently looking at phænomena as causes of Asthmatic fits, which merely follow variations in the density of the air, as effects equally with these.

Active Motion in a warm air, with frequent respirations, produces a great increase of exhalation from the superficial capillaries, and from the lungs. The further augmentation of heat, is by this means prevented: but this is not the only consequence of profuse exhalation in the Asthmatic subject. The tone of his pulmonary exhalents being much reduced, a great and sudden abstraction of heat may leave them in too torpid a state to contract upon their contents. But the general vascular tone, though lowered, not being reduced so much as the tone of these exhalents and the *vis a tergo* being greater from occasional causes the serous part of the blood passes through the enlarged apertures into the air cells.

The *Dissipation of Heat,* by this means, is productive of the most severe fits of Asthma. **Floyer** had most returns in the hot months, and they were likewise the longest. The month of August was particularly his enemy, and I have seen in August and September more serious paroxysms than in any other months; for, in this period of the warm season, the body is relaxed from the heat having continued for several months, and the predisposition to be influenced by this exciting cause, and by the great rarity of the air, is therefore much stronger than in the earlier months. This seems to account for many patients suffering asthmatic attacks during the hot months, who might have been expected to feel more of the disease during the prevalence of the north-easterly winds in the spring.

But heat may be carried away from the body by other means besides exhalation, and this effect takes place in frosty weather, but not with the same consequences to the Asthmatic. A *frosty air* is more dense, has more weight for its bulk, and contains a greater proportion of oxygen in the quantity inspired at every inspiration. A person also breathes quicker in this air, and therefore takes more frequently a change into his lungs, oftener decomposing it, inhaling oxygen, and discharging carbon. The influence of cold upon the capillaries, would be injurious in this case, if not speedily counteracted by this animating remedy, for the weak contractions of the vessels, and the chronic poverty of blood.*

Besides the loss of heat locally or generally inducing a torpor of the vessels, a deficiency of other stimuli may occasion it. *Distension* excites the actions of the whole arterial system, and therefore the paroxysm of Asthma may be excited by the sudden withdrawing of a part of this natural stimulus.

Profuse Bleeding, spontaneous or artificial, may leave the vessels with too little stimulus from their contained fluids, both on account of the want of distention, and of the want of a pungent quality, which red globules and gluten give to the blood. The capillary vessels will in this case not contract as in their healthy condition, and the fluid being thinner, as well as weaker, will more readily escape.

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* See Dr. Crawford Exper. and Observ. &c. also Minutes of the Society for promoting Philosophical Experiments and Conversation. Exper. &c. concerning Respiration.

"Animals," says Dr. **Hales**, "when they are "near expiring, do usually breathe quick, the "lungs then labouring to heave fast, that the "languid blood may have a freer course through "them, to supply the then almost bloodless pul-"sations of the heart, as was the case in the "experiment of the mare when her blood was near "exhausted."*

When by the great evacuation of blood, the vessels lost their stimulus, the animal fell into cold clammy sweats, which could not happen solely from the protrusive force of the blood, but must have arisen from the relaxation of the capillary exhalents.

There is reason to apprehend, that an injudicious use of the lancet in pulmonary complaints has brought on Asthma in some instances. I am certain of this effect in others where a Dyspeptic pain of the stomach was supposed to indicate pneumonic inflammation.†

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* Hales's Statical Essays, Vol. II. p. 6.

† See the remarks on bleeding in a following Section.

Violent purging or Vomiting may excite the paroxysm, or indigested matter in the first passages, productive of those evacuations, may, at the same time, irritate the respiratory muscles of the abdomen and thorax, into such an excess of contractions as form the *Third Species* of this disease. But considering the exhaustion and debility occasioned by purging and vomiting in cases of the First Species, the alimentary canal is left in a condition powerfully adding to the predisposition to Asthma. When this artificial depletion is not called for by the presence of irritating matter in the first passages, it is not less productive of the fit, then fasting is. When purging is required the habit of the patient must be considered capable of bearing the discharge, both from its particular condition of tone, and the comparatively greater injury which it sustains from the qualities of the ingesta or of the secretions of the liver and alimentary canal.

The *Want of Food*, or a neglect of regular meals, will as certainly excite the paroxysm in some asthmatics, as a moderate and light supper of tender animal food has alleviated the distress in others, when, in some instances of long established complaint, the approach of the fit was plainly indicated by the feelings of the patient.

A critical attention should therefore be paid to the calls of the stomach, and to the power of that organ to perform digestion. The first should never be neglected, and the latter never oppressed. If the stomach be loaded, the fit will be more violent than after the occasional cause of fasting.

Fasting is not only an exciting cause of Asthma, but it will, according to its duration, increase the predisposition to the disease, by lowering the heat of the body. Animal heat may not be dependent solely on the decomposition of the air in the lungs; or, if it be, that operation is much influenced by causes variously affecting the habit through the medium of the alimentary passages and otherwise.*

A sudden *Increase* in the *Impulse* of the *Circulation* may excite the paroxysm of Asthma. It may be supposed, that previously to the effusion of serum, a gradual distention of the vessels had taken place. Dyspnœa attends the progress of this alteration in the tone of the vessels, and is augmented as it advances. When the vessels are no longer dilatable, they may be ruptured, or effuse by their capillary branches their serous fluid. Exciting causes will hasten this event, and rapid or violent bodily motion, by impelling the blood suddenly to the lungs, is one cause.

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* See Mr. J. Hunter, on Animals producing Heat; also Dr. Percival's Essays, Vol. II. on Famine.

Upon the *Suppression* of the *Hæmorrhoidal* or *Menstrual Flux*, a subject disposed to pulmonary accumulation of blood, or whose vessels are weak and dilatable may suffer Dyspnœa, or a paroxysm of Asthma. A restoration of the suspended discharge removes the difficult respiration.

The same may be said of *Repelled Eruptions* or *Gout;* but causes of this kind do not often excite the periodic paroxysm, except in persons who have before sustained it. If the breathing be affected from such exciting causes, when Dyspepsia and the Asthmatic habit are not established, the affection may be rather called Dyspnœa, or, if attended with fever, pneumonia or peripneumony.

The membrane of the air pipes of the lungs is defended more considerably from the acrid particles floating in the air, in the species of Asthma now under our consideration, than in the natural state where this disease is absent.

But the muscles of respiration of an Asthmatic are at all times very irritable in consequence of the frequent repetition of his paroxysms, and slight offences may therefore induce a fit.

Dust of any kind is an exciting canse. Hair powder has been observed, in many instances, to bring on first, sneezing, then, by the association of muscles, more powers are put in action, to expel the irritating matter, which may, possibly, have only touched some points of the trachea uncovered by mucus.*

Metallic Fumes of all sorts are very pungent, and will shew their effect on an Asthmatic, by exciting a paroxysm.

The *Smoak of Tobacco* is, in most cases, offensive to the Asthmatic, and even when the custom of inhaling it is pursued, and absurdly thought to be a remedy, the patient inspires the very qualities which are constantly being ejected in natural respiration, and he thus strengthens the predisposition to the disease. It is affirmed that smoakers are Asthmatic, and **Diemebroeck** found their lungs dark coloured, approaching to black, and ulcerated.*

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* See Floyer's Treatise, p. 74, &c.

Sir J. **Floyer** mentions a patient who smoaked to cure a pain in the stomach, and by this means acquired the Asthma.

Fetid Smells are sometimes causes of the fit, but not often, unless particles not dissolved, but diffused in the air, are received into the trachea.

Strong Perfumes, generally called sweet, are as likely to excite a paroxysm as fetid smells. They all phlogisticate the air to a small degree, and though the eudiometrical experiments of M. **Achard** prove no considerable injury from the mixture of these fumes with common air, the sensible membrane of the trachea and bronchia of an Asthmatic, is a test which frequently supersedes all reasoning from philosophy*.

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* Diemerbroeck, Lib. II. p. 444.

The *Aerial Carbonic Acid* is an exciting cause recorded by Sir J. FLOYER. I have known the inspiring of the vapour of fermenting substances in brewing, to be followed immediately by the paroxysm.

The *Passions* of the mind may excite a paroxysm, or strengthen the predisposition to do it.

Anger shews its effects on the circulation whenever it occurs. The fluids separated from the blood, are determined to their excretories in greater haste, and in larger quantity. Hence a redundancy of saliva, and of bile, and a straitness in breathing, are not uncommonly the result of an impetuous sally of anger. The Dyspeptic disposition is still more certainly increased by the emotions of anger.

Joy increases the vigour of the heart and arteries, and by impelling the circulation before circumstances have allowed the contractile power of the exhalents of the lungs to be restored, their orifices may let the serum escape.

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* See Journal de Physique, Tome 26. De l'Effet des Parfums sur L'Air.

Love, Grief, Terror, appear to distress the mind and to relax the habit; they may not, however, in this view, so frequently excite the paroxysm, as they may add to the predisposition to it.

The Asthmatic is ill calculated for the enjoyment of *Venereal Pleasures,* however he may be prompted by sensation or taste to pursue this indulgence. Gratification not uncommonly excites the paroxysm.

Severe Study injures the digestive powers, and therefore increases the predisposition to this disease. Ardent thinking, attended occasionally by the satisfaction of useful discovery, and the hope of reputation, may animate the body, and invigorate the mind; but these advantages are more than balanced by an increased disorder of the first passages, from the want of exercise so necessary to the peristaltic action of the intestines.

If the *changes* of the *Moon* ever influence the motions in animal bodies, they may be supposed with great reason to excite the paroxysm of

Asthma. It appears that the attractions of the sun and moon at some periods combine their powers, and influence the gravity of bodies with greater effect.*

Errors in Diet are a great source of inconvenience to the Asthmatic, as may be expected, if we consider the Dyspeptic condition attending this disorder, and often the very cause of it. Under this head may be specified, as exciting causes, the drinking of glutinous liquors, also of liquors full of carbonic acid, with acescent materials in their composition, such as sweet wines and malt liquors; a profuse indulgence in the use of tea, and of warm watery liquids of all kinds. Heavy suppers, eating plentifully between meals, aud generally, all food taken in excess, may produce the same effect.

Eatables of difficult digestion, such as smoaked meats, pastry, fat pork or beef, water fowl, raw vegetables, sallads, and unripe fruits; also boiled cabbage and carrots, rich soups, jellies, and sauces, may bring on a paroxysm. These alimentary substances are not readily governed by the stomach of an Asthmatic, but are more likely to remain till a fermenting process takes place, when, if purging or vomiting bring no relief, the paroxysm may be excited; when these evacuations occur, such a consequence is not often prevented in the First Species of Asthma, but in the Third Species they may produce unexpected relief when the habit can bear the sudden change.

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* See Zoonomia, Vol. I. xxxii. 3.

Every thing which in Dyspepsia ought to be avoided should be abstained from by the Asthmatic, who ought to believe that his paroxysms may be more frequent, or the intermissions longer, in proportion as his prudence gives way to indulgence, or firmly resists the seductions of the table. Intoxication and surfeit are amongst the worst of the exciting causes, but they have so little allurement where the habit is infirm, that an Asthmatic is not likely to suffer from these extremes.*

Disordered Respiration has been acknowledged by all pathologists to proceed from the manifest obstructions which we have enumerated as creating *Dyspnœa*, or *Continued Asthma*. *Convulsive* Asthma has been inquired into, and been found to follow the immediate oppression of extravasated lymph in the lungs; this may be called the *First Species* of the *Periodic Disease*, as it embraces a very large majority of the cases which are met with in practice.

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* See General Rules of Diet, in Sect. XVI.

In examining the remaining species, the object of our Inquiry is more obscure. But analogy is still distinct, and we have ascertained some fundamental laws of the animal economy, which bestow considerable light upon its relations.

SECT. XII.

SECOND SPECIES OF CONVULSIVE ASTHMA FROM THE IRRITATION OF AERIAL ACRIMONY IN THE LUNGS.

Diagnostics of this species.—The Remote Causes.—Condition of the mucous membrane.—The nature and effects of effluvia. —Odours.—Instance of a convalescent from the disease of Mucous Irritation.—Deduction supporting the proposition in Sect. 2.

THE *Second Species* of Convulsive Asthma is also occasioned by irritation seated in the lungs. Being accompanied with little or no expectoration of mucus, it has been commonly called the *Dry Asthma*.

This species invades the patient suddenly, and will be generally found to succeed an alteration of the wind, or a change of situation. We may, therefore, consider the cause to be the *Acrid* or

Offensive Quality of some *subtle matter*, conveyed by the air, and attached in the act of inspiration to the sensible membrane lining the tracheal and bronchial pipes. This may be connected with the causes explained in the preceding sections, but it may be also unconnected with *sensible bulk*, and yet embody the proximate cause of Asthma.

All pathologists have been stopped in their course by this obscure disease, which, probably, confused their views of Asthma from manifest causes. Here they wanted the advantage of having set out with a precise knowledge of the external signs, and of their object, of the natural laws which govern them, and the principle of irritation which they indicated in cases where it was really conspicuous. If this first step had been attained, a view would have been opened to a path in which analogy, and the same laws would afterwards have led them forward to the object of their inquiry.

This *Species* makes its attack by day more frequently than by night, and is distinguished by there being little expectoration, and sometimes none, particularly when the complaint goes off abruptly and soon, for then the offence is probably removed by change of air and strong expirations.

If the fit continue long, the irritation may produce an increased action in the excretories of the mucous membrane of the bronchia. The most violent of the symptoms then generally subside, because the irritating matter becomes enveloped in mucus, unless the habit have arrived at that state of morbid sensibility, in consequence of which, convulsive motions remain, or return, at intervals after the cause of them had been removed.

Wheezing is not a symptom, unless the long continuance of the fit should induce such a secretion of mucus as may straiten the air pipes. But this symptom is declared by many to be entirely absent, as it was considered solely dependent on the mucus which appears in the First Species, till the Spasmodic Constriction was invented. **Etmuller** makes the diagnostics of the last species, and of this, to consist in the presence or absence of wheezing. The truth is, that wheezing does sometimes come on from the cause mentioned, but it may be particularly noticed in the second species, that the excess of muscular actions has first subsided. The Diabetes is absent, but the action of the intercostal and of the abdominal muscles, is the same as in other varieties of disordered respiration. Whether a spasmodic constriction of the bronchia take place or not, we must remain ignorant, for reasons before delivered. At the same time it may be proper to remind the reader, that the possible existence of this internal state of the bronchia in the First Species has not been denied: it may be rendered probable in proportion as the distress from stricture on the chest is great, but it conveys no indication which is not offered on more certain grounds by the external and visible signs.

That we may attribute Asthma to this kind of irritation, is agreeable to a just analogy, since we have proved that muscular motions of the same nature in the same disease, indicate an injury in some organs whose functions these muscles are intended to serve:* and though the offending matter be not apparent to the senses, we ought to prefer probable conclusions so well supported, in reasoning on the few instances which this species offers, to the rejecting of an inference drawn from a great majority of cases of Convulsive Asthma.

The predisposition in this species of Asthma is not however wholly the same as in the First Species. In this the habit is more sensible of slight offence than it is in the former species. The hydropic diathesis is not present, and frequently the tone of the vessels of the lungs is not reduced. Some turgescence of blood may appear in the face, and bleeding, if not positively useful, is not commonly injurious. Dyspepsia sometimes accompanies the attack, but not with violence. The peculiar marks of predisposition to be attended to, are the morbid sensibility or irritability of the body, and the dryness of the Schneiderian membrane.

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* See Sect. vii. p. 104—106.

Most writers have observed, that a little spitting may take place in the dry Asthma, though there be no wheezing, but the line which they have drawn takes too many cases from the species before treated of, and enlarges the list of the present, more than experience will be able to justify.

The sensible membrane of the trachea is naturally defended by its lymph from the attack of ærial acrimony, as far as the condition of bodies varying in sensibility to external impressions, will admit of this defence. Other things being equal, this guard is sufficient, and answers the purpose for which it was designed.

But if the secretion of lymph from this membrane be deficient, and the absorbing power be active, the surface of the membrane may be irritated by a thousand imperceptible points which the air conveys in the act of inspiration.

It is said, that then a perpetual dry cough, inflammation, and hoarseness attend,* but these unequivocal symptoms of phthisis do not always follow such a condition of the lungs. A more ambiguous state may prevail, which inclines to Asthma, though the danger of phthisis will always be considerable, if situation continue to expose the patient to the repeated or permanent application of the irritating causes.

The matter of this irritation is diffused in the air. *Effluvia* issue from bodies of the densest texture, and are discovered by the odour of all aromatic substances. Dr. LISTER found a number of stones which had been laid in drawers made of Barbadoes cedar, thickly covered with a liquid rosin, like Venice turpentine, though no manner of exudation appeared in any part of the cabinet. He concluded, that all the turpentine of the cedar wood had been carried into the air, and that it was then condensed into its fixed state upon the stones:

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* Observat. on Phthisis, by W. White, M. D. p. 63.

and that all odoriferous bodies spend their very substance in effluvia.*

The magnetic and electric influences depend upon still more subtle effluvia, whose activity is sufficiently known by its effects.

The astonishing divisibility of matter admits of proof to an extent which vindicates the inference of effluvia consisting of suspended particles.

Mr. Boyle shews an instance of the divisibility of one grain of copper, and proves, that this portion of matter imparted a conspicuous colour to above 256,806 times its bulk of water; a manifest tincture to above 385,200, and a faint, but discernible colour to above 530,620 times its bulk of water.† What then may not be expected from the solvent qualities of the air, or from its capacity of serving as a medium of division for the particles of matter diffused in it?

The influence of odours upon different people will be varied according to an idiosyncracy which determines them to be agreeable or not to each person. Musk is offensive to many, whilst others delight in its effluvia. Mr. BOYLE gives many instances of the effect of odours on the sensations of man; and when it is proved that such odours are offensive, there can be little hesitation in admitting the probability of their inducing Asthma, if the body have the predisposition before stated.

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* See Philosoph. Transact. No. 110, p. 224.

† The Hon. Mr. Boyle's Works by Dr. Shaw, Vol. I. p. 409.

It may also be readily allowed, that particles of matter not qualified to affect the sensations, may affect the irritability of an Asthmatic, by offending the pulmonary function; or they may be received in a state so very diluted, that the membranes may not suffer from their attack, until, by accumulation and mutual attraction, they take a more condensed and substantial form; and, by their pungency, become suddenly injurious in the lungs.

Causes of this kind are most prevalent in populous or manufacturing places. There are persons so sensible of their impression, as to be seized with a cough immediately upon entering a town; and others sustain a paroxysm of Convulsive Asthma, if they come out of the pure air of the country, and sleep in a town. The greater or less pressure of the atmosphere modifying, more or less, such inconvenience.

These facts appear to be sufficient to support the inference previously offered by analogy; and to prove the existence of irritation as the cause of this species, though its form cannot be discerned.

The simplest case of re-action in the pulmonary system, is that of expiration by coughing, and of the resistance of the trachea by the shutting of the glottis against the entrance of further acrimony: this happens when an animal is exposed to breathe unrespirable air. His respirations exhaust the lungs of good air, but nature opposes the replenishing of them with bad.

Though the irritating matter be too subtle for observation, it yet may be excreted in the vapour of expiration, as it was received without any immediate perception of its injurious effects in inspiration.

From these considerations it appears, that many of the exciting causes of the paroxysm in the last species of Asthma, may be here considered as proximate, because they induce no intervening irritation more near to the actual symptoms than that which they embody.

When effluvia fall upon the pulmonary membrane, the irritation of the particles will, in the first place, be felt according to its dryness; and, secondly, in proportion as the habit is disposed to the condition, commonly called nervous. If there have been frequent repetitions of irritating causes and convulsive efforts of the respiratory muscles, the Asthmatic paroxysm may much more probably supervene, upon the milder effort to eject an acrid particle by sneezing and cough.

When an Asthmatic is convalescent from the disease of mucous irritation, he is very liable to be the subject of this species. The energy of the absorbing system is greatly increased by the plan of cure which, it will appear, is the only successful one in treating that species. The habit of the Asthmatic is thus generally strengthened, and the morbid laxity of the pulmonary exhalents is considerably less. There is, therefore, less danger of effusion, and more absorbing action as the cure proceeds; but the *sensibility* of the pulmonary system is not reduced to a healthy standard, and the *force of habit* is yet to be overcome. The irritation of effluvia may therefore excite the usual muscular contractions sooner, as far as regards their influence, than when the membrane was defended by the lymph.*

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* If this reasoning be objected to, however justified by the symptoms, we may consider the First Species of disease as a state

I have had frequent experience of this fact, particularly in an Asthmatic restored from the state described in the preceding sections, whose Schneiderian membrane became unusually dry in the progress of his recovery, and was even affected at times with inflammation. The fluctuating qualities of the air often irritating this membrane, occasionally produced a paroxysm without expectoration, until the *habit* of relapse was at last conquered by the means pursued.

In the preceding sections it was established, that the convulsive actions in Asthma were occasioned by the irritation of some *bulky obstruction* in the lungs, and it is now shewn that the same actions may be caused by the irritation of a *subtle acrimony*, always present in the atmosphere in a greater or less degree, and ready to be inspired.

The *first* and *second species* being thus proved

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of predisposition, and that the effluvia or imperceptible qualities of air that is inspired, become the irritating cause of the fit; but under the general condition of the habit in the First Species, mucus in the air cells is so hurtful and striking in its effects, that it must be allowed to be a cause in itself.

to be occasioned by causes of *irritation* seated in the lungs, we have so far supported the proposition, that, *the excessive contraction of the* "*muscles of respiration indicate an injury or* "*offence existing in some organ which those muscles* "*serve.*"*

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* See Sect. II. p. 17.

SECT. XIII.

THIRD SPECIES OF CONVULSIVE ASTHMA FROM IRRITATION IN THE ABDOMINAL VISCERA.

Inquiry, if the immediate cause of Asthma may be extraneous to the thoracic cavity.—Association and sympathy of muscles.—The final cause and indication of sympathies.—The muscles of respiration are subservient to the functions of several organs in the abdomen.—Their convulsive contractions indicate offence to those organs.—Convulsive Asthma is occasioned by irritation in the Abdominal Viscera.—Instances of this cause.—General Deduction.

WE shall now inquire, whether this convulsive disorder of the respiratory muscles may proceed from irritation in any other part of the body. Analogy and facts support the conclusion that these actions have been excited in many instances by internal causes of irritation, below the thoracic cavity; but it cannot be made to appear with certainty, that the irritation of extravasated serum, or of aerial acrimony, was not present in the lungs at the same time. The former matter might be removed by the unobserved power of absorption; and the latter might be carried off imperceptibly in the vapour of expiration.

This consideration will make a Physician doubt respecting the seat of the disease in many cases, and ultimately, as has hitherto been the custom, refer it to the lungs. I, however, believe, that it frequently exists in some of the viscera below the diaphragm; and I attribute the general inattention to this seat of the cause, to the circumstance of the very partial view which has been hitherto taken of Asthma, and that through the medium of prejudice. If the observer had simply noticed the external actions without being biassed by theory, and carefully considered them in their relation to the functions of the viscera, he must have been led to the inference, that they justly indicate an irritating offence in the abdominal, as well as in thoracic viscera.

We must acknowledge a law of the animal economy which has been before appealed to * A Sympathetic Association of muscular contrac-

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* See Sect. I.

tions is known to take place, when the fibre of one muscle is irritated. In this manner tenesmus brings on a strong peristaltic action of the whole intestinal canal. This affection of the rectum is also excited when the upper part of the canal has been irritated; it proceeds also, as well as strangury, from inflammation of the uterus. A strangury and tenesmus mutually occasion each other. These are sympathetic affections of parts nearly contiguous, but the association of muscular actions from the same cause is still more extensive.

An irritation of the neck of the bladder, or of the extremity of the rectum, was observed by Dr. **Whytt**, to be the cause of a constant contraction of the diaphragm and abdominal muscles.* When the uterus is irritated by inflammation or pregnancy, the first passages are much disordered, and vomiting is frequently excited. In labour the most violent contractions of the abdominal muscles and diaphragm take place; in other words, muscles subservient to respiration are excited to act with increased energy, and powerfully assist in delivering the organ from its burden.

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* See Whytt on the Vital and Involuntary Motions. Also his Observations on Nervous Diseases, p. 26, &c.

But though the actions of different muscles may be associated for a good end, we have not yet in Asthma facts which shew a sympathy or association more extensive than may belong to the functions of the thorax and abdomen.

In reasoning upon sympathies, Dr. **Whytt** opposes the opinion, that they are occasioned by anastomosis of nervous branches, and gives examples of more consistent affections, which, on this theory, might be expected to take place, but which do not usually appear. It may be asked if the difficulty be removed by referring all such instances to the common sensory, without tracing the design of the several motions? Doubtless, whatever be the origin of these extraordinary sympathies, the *final cause* is the good of the animal œconomy, and the object in a definite sense must be the removing of something that is injurious to the system.

Dr. **Whytt** discovers, in the sympathies which he enumerates, some that are marked with a *Wise Intention.* He instances the contractions of the abdominal muscles and the diaphragm in tenesmus, strangury and labour; in sneezing, coughing, and the hiccup; and the "increased motion of the organs of respiration "in the fit of an Asthma; they are," says he, "the efforts of nature, to free the body of *some-*"*thing hurtful*."*

The "*Wise Intention*" of all the sympathies may some time be elucidated. Those muscles which serve the function of respiration, are never excited to extraordinary contractions, without affording to the considerate observer the indication of something that is now hurtful, or that has offended, an organ in the thorax or abdomen, which it was the natural business of an individual muscle, or of the set with which it is associates, to remove.

From the best experiments, it appears, that *Sensation* and *Irritation* are distinct properties of the living animal. It has been proved, very satisfactorily, that certain instinctive actions, calculated to avert injury or pain, may be independent of nervous influence, and they are therefore exerted without the intervention of the sensorium commune.†

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* Sympathy of the nerves, p. 72.

† Vide Croonian Lecture on Muscular Motion, by Dr. Blane, p. 26, &c.

But though this distinction, pointed out by GLISSON, enforced by HALLER, and acceded to since by the best authorities in physiology be just, it does not follow that the influence of sensation may not be communicated from the nerves, in which it is inherent, to the muscular fibres, though the latter may contract without such a medium of stimulus.

If instinctive actions be therefore performed in some instances by the muscles, without the excitement of nervous influence, they are also in other cases performed in consequence of it, and contractions take place without the possibility, of distinguishing where the stimulus was first applied, on the muscular fibre or on the nervous filament; but in addition to this general presumption, it is proved, that the contraction of a muscle may be excited by irritating the nerve leading to it, whilst the nerve itself is unaffected.

We have thus obtained a proof of the influence of the nerves on the muscular fibre, and it is of little importance to know if this influence be mutual; every purpose of practice is answered by the assent to this position, that the *sentient extremities* of the nerves, and the *moving* or *muscular fibres* have a correspondence, so strict as to induce some physiologists to think that they are extensions of the same nervous medulla.[*] The sentient nerve may cause contractions, and correspond by sympathy, with distant parts. The muscular fibre is capable of being excited by the *vis nervosa*, and it is also irritable by stimulus in consequence of the *vis insita*.

The experiments of Professor MONRO,[†] and his objections to the independence of the *vis insita* appear to leave the question exactly on this footing, and no otherwise invalidate the conclusions of **HALLER**, deduced from the irritability of the heart, after a perfect separation from the body.

Salutary actions are, commonly excited without a consciousness but of the general effect to be produced; such are sneezing, coughing, and laborious respiration, belonging to the pulmonary organ: also, vomiting and discharging fæces which are actions of the alimentary canal and bladder; in all these motions, though unconsciously excited, the muscles of the chest and abdomen are active instruments.

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[*] Vide Dr. Cullen, Institutes of Medicine, also Boerhaave, Instit. p. 395.

[†] Observat. on the Nervous System, Chap. XXVII. also Dr. Smith's Tentamen Inaugurale, p. 45.

Mr. Hunter,* noticing the analogy between coughing and vomiting, has observed, that in the former the lungs are passive; in the latter the stomach is not necessarily active, as the diaphragm and abdominal muscles are able to empty the stomach as well as the rectum.† Though this be not precisely the fact, yet the muscles of respiration are the most active instruments in emptying the lungs, and assist also in evacuating the lower viscera.

This natural alliance of powers is frequently exerted, when it would not be necessary to produce the effect desired. In violent coughing to discharge extraneous matter from the lungs, the stomach is compressed, and the diaphragm coming into action, vomiting is brought on. On the contrary, acrimony in the stomach and duodenum excites the associated efforts of all the respiratory muscles, which act by sympathy, as if the cause of offence peculiarly disturbed the lungs.*

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* Vide Observations on Digestion, p. 200.

† This was also the opinion of the French Physicians, but it has been coufuted by the Experiments of Mr. Haighton. See Mem. Med. Soc. Vol. II.

The author of Zoonomia looks beyond these natural associations of muscular motions, and is desirous of finding more remote connexions of cause and effect, than I apprehend can be supported by experience in this disease.

The object of discriminating the parts in which the cause of Asthma may be seated, is next in importance to that of discovering the cause itself. It is therefore necessary to consider an opinion on this subject, which is interesting in proportion to the authority of the writer; in doing this, I shall appeal only to the facts which he adduces.

After many difficulties in arranging the theory of Asthma, he concludes, that the Convulsive Asthma is like other convulsions, or epilepsies, " and may be occasioned by pain in almost any " remote part of the system."

He is more confirmed in his opinion from knowing an instance of one lady, whose Asthma ceased, on her being afflicted with pain, and gouty swellings of her large joints. A young man was also seized with Asthma from the retrocession of eruptions on his face.

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* Vide Willis de morbis Convulsivis, Vol. I. Chap. xii.

The laborious respiration of infants in teething is also stated to be the Asthma Convulsivum exerted to relieve pain.

The author gives no example in adults of the supposed pain being seated farther from the lungs, than the liver, or biliary ducts. And relief from pain being transferred from the trunk of the body to the limbs, with a cessation of Asthma in consequence, must be considered as evidence of the disease having been occasioned by a cause seated in the trunk, if the fact be appealed to.

The teething of infants may produce a quick respiration, but has the observing physician remarked, that it was then unaccompanied by fever, or disorder of the first passages? Pyrexia distinguishes this difficulty of respiration from the Convulsive Asthma of adults; and the effect of the pain on these irritable and tender subjects appears most in that affection of the stomach and bowels which almost constantly attends dentition.

If Convulsive Asthma be excited by causes of pain or injury more remote from the muscles of respiration than the organs in the chest or belly, it might be expected to take place in cases where convulsions of the whole body are observed, but this disease has not been occasioned, as Tetanus has been, by a prick of the toe.

But we may justly believe that where no disorder of the lungs has appeared, and where little or no mucus has been excreted in the progress of the complaint, a cause of injury or irritation may have existed in some of the other viscera whose functions are served by the same muscles that are then thrown into such violent action.

The intercostals, the diaphragm, and the abdominal muscles are the common property of all the viscera of the chest and belly, and discover their uses when fæces of the blood are discharged from the lungs in mucus, or in carbonic acid and vapour; when any acrimonious matter is vomited from the stomach; when excrement is expelled from the bowels and bladder, or a stone from the kidnies, ureters or bladder, and when any extraneous matter whatever is discharged from the uterus.

In these cases the muscles we have mentioned may naturally associate their motions, and the indications are not obscure; until there be good evidence of a more remote seat of the immediate cause of Asthma, it is unphilosophical and useless to desert these limits.*

In Sect. II. and III. of this Inquiry, we have already given instances of disordered respiration from causes existing in the abdominal viscera; and though the form of disease which appears in these cases be generally that of Continued Asthma or Dyspnœa, periodical exacerbations may be often observed, which are the unavailing efforts of the muscles, or the *motus medicati* increased to remove the offence.

When these permanent causes do not exist, the paroxysm may take its regular form from immediate irritation in parts below the diaphragm, especially in the hollow muscles.

The great relief which is sometimes obtained by vomiting or purging, shews, that acrimony in the *stomach or bowels* may be a cause of the Convulsive Asthma; but the example of such critical evidence is not to be confided in, unless the paroxysm totally subside in consequence of these evacuations. If the convulsive respiration be clearly removed by such discharges from the stomach or bowels, we have proof, that in these instances, no other acrimony or offence excited the actions than what was seated in these passages. If, on the contrary, the paroxysm do not entirely subside, we must remain in doubt; or, by a prudent comparison of symptoms, decide, whether the remaining motions are the effect of *habit*, or arise from irritation remaining in some other organ. The necessity of such deliberation very often occurs in practice, and unexpected relief may be given by antispasmodics, or the physician must persevere in waiting attentively for expectoration, or some other discharge.

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* A very curious case of Convulsive Cough is recorded by Dr. Whytt, arising, seemingly, from consent with the sensations of the lower extremities, but the respiration in Asthma is performed by a complicated association of muscles, of which, a cause similar to that of the Convulsive Cough is not yet known.

The Diabetes of Asthmatics deserves to be considered with a particular reference to the diseased state of the stomach. Dr. FERRIAR* remarked, that in the cases of Chronic Diabetes which he had seen, Dyspepsia always preceded, and **SYDENHAM**[*] had regarded it, as dependent on the last disorder. When the stomach is distended with gluttony, or even in common instances with flatulence from its weakness, it compresses the vessels, bringing back blood from the lower viscera to the heart; the emulgents then find a difficulty in forwarding their contents by the corresponding veins, and relieve themselves by passing their serum into the kidnies. The oftener this necessity occurs, the readier will be the exit, and the more resorted to by the animal economy as a mode of relief.

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* Med. Hist. and Reflect. vol. ii. p. 53.

This seems to be a mechanical effect of a distended stomach, but the vitious juices which are secreted in it during its morbid state, added to the corrupted ingesta, may occasion, it is probable, such unnatural chemical combinations as may produce diabetes.

Irritations frequently occur in different organs at the same time, but principally in the *stomach and duodenum*, when they are confined to the abdominal viscera. **FLOYER** gives histories confirming this fact, but he does not make use of the principles which are here taken from nature; and no writer has before directly applied the muscular motions of Asthma to the purpose which is now pointed out. We have suggestions and hints which do not perfectly reach the object, though it appears in great simplicity. Instances of disorder in the first passages, or biliary ducts of Asthmatics, have been remarked by many physicians; and I have no doubt, if more attention were paid to the subject, that much additional evidence would be produced that would strengthen the conclusion of those affections causing Asthma. Dr. FERRIAR* gives the case of a lady whose paroxysm terminated with sickness and vomiting, and MILLAR points out these evacuations, or the discharge of wind, as the means of critical relief.

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[*] Epistola Respon. I. p. 271.

WILLIS speaks of Asthma from sympathy arising from a stone in the gall bladder.

HOFFMAN has cases of the same kind.†

I have met with numerous instances in which disorder of the stomach was only indicated. A ady was affected with orthopœna and great distress every night; she had a strong acidity and great inflation of the stomach. The respiratory actions were truly asthmatic, but they disappeared upon a return of healthy digestion, which took place when a secret cause of uneasiness was removed: she had, however, frequently discharged from her stomach acrid or bilious matters with instant relief to her breathing.

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* Med. Hist. &c. Vol. II. p. 53.

† De Asthmate Convulsivo, Obs. 2. 4. p. 193.

The *Hysteric Asthma*, is probably, occasioned very often by the disordered state of the first passages; and if it be attended with wheezing, this symptom may be explained by the pressure of the trachea, from the distention of the œsophagus.

An Asthmatic at sixteen years of age parted with a considerable quantity of ascarides and some round worms, and had no fit for two years afterwards.

A stone was found in the *kidney* of an Asthmatic, recorded by Ruysch, and probably added to the irritation exciting the disease.

The *uterus* may be the seat of irritation, which, I have no doubt, frequently occasions Asthma. Females, of constitutions peculiarly irritable, and still more if they have sustained dyspnœa, may readily fall into the paroxysm at the period of menstruation, when the uterus being turgid with blood, may create a perception of something necessary to be discharged. In such an instance, can any effort be more natural than that of the very muscles which are so often employed in discharging substances from the uterus?

The hysteric lady in FLOYER began to suffer Asthma at the age of fourteen. Distress of mind is described as a remote cause of her complaint. Dyspepsia followed, which when united with a particular condition of the uterus, might immediately produce a paroxysm.

Dr. WAINWRIGHT knew a lady who had a fit every time her menses flowed, and was worse for all medicines for seven years, but afterwards had relief *.

If the irritation in the uterus be permanent, and continually inciting muscular reaction without relief, convulsions more violent than in Asthma,

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* Mechanical Account of the Non-naturals, &c. p. 14.

and more extensive, may supervene. A young person, ill of the Asthma, was unexpectedly attacked with epilepsy. The fits of this disease returned frequently in the day, and almost every day for several months, and no cause could be discovered sufficient to produce these effects. "At "last, excruciating pain in making water overcame "the particular false delicacy, and obliged her to "disclose their source, which was an acrid discharge, "excoriating the vagina, proceeding from a diseased "uterus."*

The communications of nerves may be mentioned, as very probably connecting many of the motions excited by irritation in these viscera; but I am satisfied with the close analogies of facts, without launching farther into conjecture than experience and observation may justify.

It has appeared in the preceding sections, that Convulsive Asthma is caused by the irritation of some material in the lungs.

We may conclude from the analogies, the reasoning, and the facts before us, that it may also be caused by *irritation in some of the abdominal viscera, but particularly in the stomach.*

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* Considerations, &c. by Dr. Beddoes and Mr. Watt. Part IV. and V. p. 89.

Additional remarks on this species, with cases, to prove the importance of the subject, will be offered in a succeeding part of this Inquiry.

SECT. XIV.

FOURTH SPECIES OF CONVULSIVE ASTHMA.

The Consequences of Convulsive Motions.—Convulsive Asthma remaining after the Irritation has been removed.—The influence of habit.—Repetition of morbid motions, arising from sensation and perceptions of the mind.—Fever counteracts the principle of habit.—Instances of mental impression operating upon the body, and inducing morbid motions.—Ideas of relation.—The Hysteric Asthma.—RECAPITULATION of Facts and Inferences.—New arrangement of Species of Asthma.

WHATEVER may be the origin of a convulsive disorder, a certain consequence of its repeated attacks will be an increased mobility or sensibility of the muscles. Asthma is particularly attended by this inconvenience, as appears by the paroxysm returning after the irritation or offensive material which had occasioned it had been removed.

It may therefore be said to exist without any apparent, or even probable cause. This surprising circumstance is to be explained on principles by which the animal economy is always regulated, and may be the effect of *perceptions* of the mind exciting, by the medium of *sensation,* motions of the body when under the influence of *habit.*

The original motions were probably caused by *irritation* only, or that instinctive feeling of injury which is immediately followed by the reaction of the muscles. *Sensation* has been stated to be a distinct property of the living fibre ; but it is as capable of producing motions in the body, as of being produced by previous *Irritation. Habit* consists in the facility with which a muscle repeats its former motions, and with which it acts in association with other muscles. It may be called the predisposition to this species of Asthma, of which *sensation* may be considered as the proximate cause.

Every sensation of the body is connected with a perception or an idea of the mind, which being recalled by the memory or imagination, brings back the sensation combined with it: if a complex idea be recalled, complicated sensations may be revived.

Thus the state of some organ having caused Asthma, by its Irritation, makes a sensation of the body, creating a perception or idea of the mind, which may be associated with other ideas. If any one of these be recalled by memory, others may be restored, and with some of them the corresponding sensations of the body, or of the irritated organ; and thus, the very emotions of mind, or the muscular contractions of the body, which had been either the cause or the effect of such sensations, may return.

In this view the repetition of muscular convulsions is not always obscure in its principles as it has proximate and remote causes, though not in a *material* form, and may readily take place, if pyrexia do not prevent it. In cases of those poisons which produce fever, an insensibility of their future stimulus is commonly conferred with the disease;* but in cases of irritation not producing fever by its specific quality, as in Asthma, the system will be more liable to convulsive actions, the oftener they have been performed; and this may be the effect of sensation, as well as of very inferior, and seemingly inadequate causes of irritation.

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* As in Small Pox and Measles.

When *Phthisis* has supervened upon Asthma, the hectic fever destroying the force of habit, the periodic paroxysm is not preserved, but subsides into moderate dyspnœa.

In comformity to these principles, pneumonic inflammation may have left such a debility of the capillaries of the lungs, as to cause an effusion of serum into the air cells: this state may have continued but a short time, and the convulsions of Asthma may have taken place for a few hours only, yet ideas may have been raised by the sensations of this paroxysm, and even by the circumstances accidentally connected with it, which, recurring at intervals, may restore such sensations, and through these the convulsive motions at first united with them. Paroxysms, from such causes, have occurred in many convalescent subjects, when the primary cause, after a considerate balance of all the circumstances, was not suspected to exist.

Operations of the animal economy from ordinary causes of greater simplicity, will explain the subject more clearly.

In the discharge of urine and alvine fæces, certain ideas become linked by sensation to the animal motions excited by the distension of the hollow muscles of the bladder and intestines. A propensity to the evacuation of these fæces may afterwards return at periods, when the ideas of time or place introduce the connected sensations of such discharges; and the abdominal muscles, and diaphragm and bladder, are then excited to contract though the stimulus of distention be, in fact, not present; but by habit, the peristaltic motions are brought to obey the new rule of the œconomy, and urine is even secreted against the arrival of these periods.

The effect of frequent emetics is well known: the stomach is rendered more irritable by their repetition; and ideas connected with the nausea created by the medicine, very frequently induce the nausea without its assistance. The sight of a phial, or of a liquid, with which the operation had been promoted, by raising associated ideas, led to the very impression of the first link, and excited the contractions of muscles which empty the stomach, and still further, the associated contractions of other muscles, which, by the usages of the animal œconomy, had before acted with them.

The powerful influence of ideas which circumstances may have connected with a particular impression, is too well ascertained to be doubted. The sensation of terror has induced syncope, epilepsy, and hysteria. The object which excited that sensation, may not only renew these bodily disorders by its own re-appearance, but circumstances may raise associated ideas, connected with a train of sensations, the individual parts of which successively introduce each other. When this association is established, the same animal motions may return from apparently dissimilar causes, but these may be considered as remote causes of the sensation immediately causing the disease.

A lady had been thrown into terror by a footpad, and for the first time sustained a series of hysteric fits. Her constitution became feeble and acutely sensible. The disease returned on smaller alarms for many years afterwards, and particularly in consequence of slight circumstances which referred to the attack, though entirely distinct from it. After three years, during which interval she had diversified her impressions in a distant neighbourhood, she passed in a carriage along the road, and near to the spot where the assault was made; when affected by the chain of ideas, and her attention to them, she relapsed into strong convulsions.

A female had been long subject to dyspeptic complaints and to irregular secretions of bile. She married at twenty-five years of age, and then found it necessary to employ herself in business, and to attend with great care to an increasing family. These objects gave her the most trouble on Sundays, on which day she gradually became more indisposed with Hemicrania; but, on the other six days, she had her usual health. In ten years the complaint was much aggravated, and it affected her earlier by a few hours, but did not cease sooner than before. In this form the intermittent disease continued for several years, evidently excited by the great anxiety and fatigue of one day in the week.

Her situation was again altered: Sunday became a day of rest, and an improvement of circumstances diminished her general anxiety. It might be supposed, that the Hemicrania would be lost with the impressions which brought it on, but it still returns at its former periods, being linked with ideas of relation that arise from external circumstances. It is probable that a complete change of residence, by which the impressions might be obliterated, would destroy the force of habit, and overcome the disease.

The case of Hysteric Asthma in FLOYER,*

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* Floyer, p. 17.

was probably first caused by a disorder of the stomach. It appears that affliction, at the critical age of fourteen, had thrown the lady into hysteria. Dyspepsia accompanied her agitation of mind, and the acrimony of the first passages, which naturally follows the disturbance of digestion, might irritate the system of muscles into a paroxysm of Asthma.

The same contractions of the muscles would be subject to return, when the habit of their associations had been once established. Slight causes of irritation might excite their convulsive efforts, which, though fruitless, would be consistent with the laws of animal life. Certain ideas, which in the first attack of hysteria, at the age of fourteen, concurred with a particular condition of the uterus to bring on the affection of the stomach, œsophagus, and respiratory muscles, being occasionally recalled, would revive motions more readily from habit and repetition.

Thus are many causes apparently lost, whilst their effects are continued in the diseases which they produced; habit rendering the body liable to a recurrence of morbid actions, in proportion as the ideas annexed to them, by circumstances, may lead to the sensations which are now their real cause. The revolutions of seasons, the changes of day and night, the hours of rest and activity, the hours of meals, the objects of pleasure or pain, the connexions of friendship, or business, become united with the motions of the mind and body; and thus associated morbid actions are revived, according to their former situation in the general chain.

All this is well known; but, like many other parts of knowledge, the result of common observation, the impression has been superficial, and too much neglected in practice.

But all physicians have acknowledged the strength of indications afforded by habit in the disease of chin-cough. Here every part of the usual plan of life and diet, is directed to be changed. A new air is particularly requisite, whatever be the standard of its purity; and by thus counteracting the former perceptions, the disease will frequently vanish without the continuance of medicine.

In epilepsy, a disease observing periods, like Asthma, Hippocrates directs a total change in the manner of life, that former habits may lose their influence.

In Asthma, if in any disorder, a similar alteration ought to be enforced; and, as will appear in the practice, the judgment of the Physician will be defended by the event.

WE have now taken a view of Asthma under all the forms in which it has been said to appear.

Much more might have been said upon Disordered Respiration, but affections of the lungs, attended with fever, are not to be considered upon the principles of this Inquiry. These cannot be esteemed cases of Convulsive Asthma; and Continued Asthma has been sufficiently noticed.

It may be convenient to recapitulate in this place the principal facts and inferences on which I have endeavoured to establish the distinctions laid down in the preceding sections.

RECAPITULATION.

In Sect. I. The nature of *Convulsive Motions* is stated. These are shewn to be *re-actions* of muscles for the purpose of removing injury or irritation. This is an axiom in pathology.

The popular term, *Difficulty of Breathing*, is then proved to consist chiefly in such *re-actions* of the respiratory muscles, and not merely in causes of opposition to the free inspiration of air.

The re-actions of the abdominal and the thoracic muscles are commonly associated. A perception of irritation in the rectum or bladder is followed by moderate re-action, as a natural effect. A similar perception in the lungs, though not from common causes, is followed by stronger re-action, for the purpose of relieving them. And in all cases of irritation in the viscera of the thorax or of the abdomen, the same muscles are the instruments of relief.

Sect. II. Having established the fact, that convulsion is a re-action of muscles, caused by injury or irritation, we are led to consider the *irritations* which produce the Convulsions of Asthma. Some of these had been noticed as *manifest* causes of *Continued Asthma,* in which the same external effects appear as distinguish *Periodic Asthma.*

It is easy to follow *effects* that are *manifest to causes* that are also *manifest,* and their connexion is not likely to be disputed, so that the evidence of these causes of Continued Asthma appeared to be a true and proper basis for the following proposition, viz.

" *The excessive contractions of the muscles of*
" *respiration indicate an injury, or irritation in*
" *some organ which those muscles serve.*

In Sect. IV. We arrive at *Convulsive Asthma ;* so called by general consent. Here the external re-action is a manifest *effect,* as in the Continued Asthma; but the *cause* is frequently not manifest without investigation of facts and analogies. Yet as the Periodic and Continued Asthma only differ as the re-actions more or less remit: and as similar effects proceed from similar causes, we are disposed to attribute such re-actions to irritations, however obscure. These are investigated by tracing them from their effects, and from the appearances which they occasion in the disordered system.

Sect. V. In the *First Species*, the appearance of mucus is a leading feature. All, except modern writers, considered this material, or one equally manifest, as the cause. It is shewn, that no such disease as Convulsive Asthma, without a manifest cause, was noticed from the earliest records of medicine, till the time of **Cullen**, who, however, denied to the majority of cases, the existence of such a cause. To determine an important question, whether a material or manifest cause exist or not in this disease, the evidence of dissection is next examined.

Sect. VI. In many cases an excessive collection of lymph was found in the air vessels after death. But the most convincing proof of such a cause is taken from living subjects. A violent affection was discriminated by Drs. **Darwin** and **Beddoes**, as a case of Convulsive Asthma, in which "large quantities of the frothy serum were "thrown off," and the patient recovered from her insensibility. The description of Asthma by **Cælius Aurelianus**, corresponding with the state of this patient, corroborated their opinion of the nature of the disease.

An objection may be made to the possibility of an animal being preserved with such an effusion of fluid in the lungs; but this is obviated by the experiments of Dr. GOODWIN and the Author, who found, that, by avoiding the passage through the larynx, the oppression could be borne without instant death; and, finally, be overcome by absorption.

Sect. VII. It is next inquired, what state of the lungs permitted the passage of so much lymph. The explanation depends on the preceding facts and inferences. The capillary vessels, greatly weakened by remote causes, let the serum pass; the effect of which is difficulty of breathing, or a re-action of muscles, to remove the inconvenience.

The remaining diagnostics are then considered, and referred to the same cause as that of *Difficulty of Breathing*. The air-cells not being able to collapse, there is, at first, *little or no Cough;* but, in proportion as the fluid is lessened by absorption, the cough increases, attended with *Spitting;* and the "obstacles to a free and full inspiration, preventing also a free and full expiration," are accounted for by visible signs. *Wheezing* and *Straitness* are occasioned by the obstruction of lymph, and by the state of the stomach and œsophagus, which was a remote cause preceding the difficulty of breathing in the fit.

Sect. IX. Other symptoms are detailed, which frequently, but not constantly, attend this species of Asthma. None of these is inconsistent with the cause assigned; and the most remarkable of them can only be accounted for by its existence.

Sect X. The *predisposing Causes* are naturally connected with this proximate cause of effused lymph. *Dyspepsia* and *Irritability* are the most important of all. The muscular re-actions take place sooner or later, as the predisposing Irritability is greater or less in the asthmatic subject.

Sect. XI. The *exciting Causes* are detailed; each of which may suddenly bring on the paroxysm: they are therefore all objects of practical attention.

Sect. XII. The *Second Species*, usually called the Dry Asthma, is traced to *Aerial Acrimony* in the lungs. As the fits were very capricious, and the cause obscure, a conclusion was drawn, and readily assented to, that a spasm of the bronchia occasioned this disease: but in reasoning upon it, a previous induction, from conspicuous facts, was much wanted. If a distinct conception of the external re-actions had been attained, and the laws of animal life which govern them had been justly applied, irritating causes would have been clearly seen in many cases. And after this essential step, analogy, and the same laws would have been safe guides in inquiring after the causes of others.

It is shewn that *subtile matter* may be conveyed insensibly to the branches of the trachea, and that it may suddenly occasion muscular re-action in the same manner, as a cause of sensible bulk.

Irritations seated in the lungs having been thus shewn to occasion two species of the disease, the proposition in Sect. II. is so far supported by both.

Sect. XIII. In the *Third Species* there is a new object of inquiry. Diseases of the Abdominal Viscera had been observed in cases of Asthma; but they had not been considered as proximate causes; nor could they be so considered till the muscular re-actions were better understood. In these consists the paroxysm, which may take place for the purpose of removing injury from the abdominal, as well as from the thoracic viscera: all the acting muscles being common instruments of relief to all these viscera.

Acrimony in the stomach or bowels, very probably, causes re-action in many cases, and merits great attention. Thus asthma may be said to begin in some very irritable habits, at a period, which, in others less irritable, is that of predisposition only.

A conclusion is drawn from these premises, that a third species of Asthma is caused by "*Irritation in some of the Abdominal Viscera, but particularly in the Stomach*," still further confirming the proposition.

Sect. XIV. The *Fourth Species* is that disease which, having been originally caused by the irritations above-mentioned, retains its form of muscular re-action from habit. *Ideas* of the mind may revive *sensations* of the body, that act upon the predisposing *habit.* In this view, sensations are the proximate, and ideas the exciting causes: and instances are given of their power, both in the ordinary actions, and in the diseases of the animal œconomy.

Convulsive Asthma is therefore divided into Four Species, each of which is distinguished by the property and situation of its irritating cause; and all are governed by the fixed laws of animal life.

We may probably obtain a more clear direction for practical purposes in treating the disease, if a new order of species be set out, on the view of the inferences which have been drawn from *Facts* and *Analogies* in the preceding sections.

I shall therefore propose the following arrangement of Species of Asthma.

DISORDERED RESPIRATION, unattended by Fever, may be divided into **ASTHMA**, *Continued* and *Periodic*.

Continued Asthma cannot be properly said to be free from Convulsive Contractions of the respiratory muscles, but these are carried on without regular paroxysms. They are more permanent, but less violent, and depend upon fixed irritation, Abdominal or Thoracic.

Periodic Asthma, discovered in regular paroxysms of convulsive contractions, and therefore usually called *Convulsive Asthma*, which term we adopt as describing its character, and still complying with general custom.

CONVULSIVE ASTHMA.

1st Species, from the Irritation of Effused Serum in the Lungs.

2d Species, from the Irritation of Aerial Acrimony in the Lungs.

3rd Species, from Irritation in the Stomach, or in some of the Abdominal Viscera.

4th Species, dependent upon *Habit,* and caused by *Sensation,* after Irritation has been removed from the Thoracic or Abdominal Viscera.

These are the Species to which I shall refer, in the Second Part of this PRACTICAL INQUIRY.

THE
PRACTICE IN ASTHMA.

PART II.

SECTION XV.

The Cure of Convulsive Asthma attempted.—Indications arising from the distinction of Species.—The Paroxysm, including exacerbations.—In what the Cure of Asthma consists.—Remedies tried.—Cathartics.--Emetics.–Diaphoretics.--Bleedings:—Diuretics.—Issues.—Antispasmodics.–Expectorants.---Blisters. — Inhaling of Vapours. — Oxygen.—Hydrogen. —Stomachics.—Absorbents.—Stimulents.—Bathing.—Tonics.

AFTER a full consideration of the facts in the preceding sections, and the inductions from them, it will not be expected, that, in attempting the cure of Asthma, I shall confine myself to the lines which have been marked out by former writers, who, had not sufficiently attended to nature, but adopted grounds of reasoning and rules of practice that were hypothetical.

A Professor, who directed the opinions which still influence the schools of medicine, and whose authority concentrates the theories of former teachers, gives no encouragement to the pupil, nor confidence to the Physician, in following the indications which he has proposed for the treatment or cure of Convulsive Asthma.

" As it is seldom," says Dr. CULLEN, " that " an Asthma has been entirely cured, I therefore " cannot propose any method of cure which ex- " perience has proved as generally successful." He, however, states the disease " to admit of al- " leviation in several respects from the use of " remedies, and he makes it his business to offer " some remarks upon the choice and use of the " remedies which have been commonly employed " in cases of Asthma."*

I am obliged here to dissent from this practical observation, as experience convinces me that there is even less opportunity of removing an existing paroxysm of this disease, than there is of preventing its return, in which the cure must at last be said to consist.

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* Cullen's Practice, MCCCLXXXVII.

Cullen particularly followed the authority of **Floyer** in his doctrine on Asthma; but did the success of this physician, in treating his own complaint, induce the Professor to adopt his theories? **Floyer** laboured under Asthma for thirty years, and we cannot therefore much confide in the judgment of his practice.

It is time that other indications should be followed than those of relieving spasmodic constrictions of the bronchia and turgescences of the blood vessels, or let us rather become empirics, and take the chance of benefit from experiment, and the happy success of blunder, than rely on directions which confessedly do not truly point to the object of our wishes, and may possibly lead us into error.

The author of this Inquiry had the strongest motives for his attention to Asthma. Having felt its attacks for many years, he had a prospect of being subject to their returns as long as Sir **John Floyer** actually experienced their tyranny, if he had not at length determined to consider the disease as if it had never before been treated, and resorted to a practice which was not prescribed by former rules. His endeavours afforded present instruction, and suggested the means of further improvement, as the *Juvantia* and *Lædentia* more clearly discovered the true character of the disease, and the treatment it seemed to require. During the course of his trials and personal experience, he was so often the victim of established theories, that he could not give them credit. Despair at length gave place to hope, and he can now affirm, that the doctrines of the preceding sections were the result of experience of the effect of remedies, as well as of observation of symptoms, and a careful comparison of analogies.

He had observed the serous effusion in the air-cells of the lungs of an Asthmatic in the year 1786, but he had not been led to the conclusion that the disease was generally occasioned by an irritation of that kind, till his own sufferings induced him to examine its forms under all circumstances and every influence. Impressed by the salutary caution of CELSUS, not to mistake effects for causes, he had not yet sufficiently reflected on the degrees in which effusion might take place, but considered the appearance in this case as evidence only of the termination of a violent disorder, or the immediate occasion of death.

At length a further consideration of this dissection prompted him to act more decisively against the predisposition. He next extended his inference from the appearance, and consulting analogy and the laws of animal life, he took the convulsive contractions for indications of this irritating offence, which he found might exist in greater or less quantities, according to the extent and prevalence of remote causes.

His satisfaction was still greater when he at last found that the same *principle* of irritation might occasion the disorder in the other species of Asthma in which mucus did not appear, his practice at the same time continuing to answer with great success to the indications which he had consulted as true.

The doctrines of the preceding sections may therefore claim the confidence which is generally given to experience; and there is the less occasion for being diffuse in the remaining part of this Inquiry.

I must, then, request the reader to consider the Species of Asthma and the inferences proposed in the former sections, as marks to guide his medical attention, which have not been set up without mature regard to the force of remedies which they point out in this disease.

A *Paroxysm* of Convulsive Asthma, is that state of the disease which has an *Exacerbation* at night as long as it lasts: and though the paroxysm be generally attended by at least *Three Exacerbations*, it sometimes is extended through many more, nor is there any certain limit to their number. If it has not embraced so many as three, benefit may be said to have been derived from some operation of art or nature, when the patient has a confirmed predisposition to the disorder, but it cannot be said with propriety that an advantage has been gained, if the exacerbations have been renewed as often as was customary in former fits, or oftener than three times, if the disease was new. Much less can a cure of Asthma be asserted until an entire change in the habit of the patient, comprehending vigorous digestion, and easy respiration, be well established after the paroxysm has been long overcome.

The cure of the Convulsive Asthma can therefore be only attempted with a prospect of success during the intervals of the fits. But the distress of the paroxysm may be frequently alleviated; and whoever has experienced its agony, will allow the value of the smallest improvement in treating it. There is an additional motive for vigilant attention to the paroxysm, as it may furnish very frequently the opportunity of examining the natural powers of the patient's habit.

I shall notice different classes of remedies which have been proposed or tried in Asthma, pointing out the treatment which may most generally be adopted to relieve or shorten the paroxysm; and afterwards recommend, from experience, a plan of *Cure*, illustrated by a few examples, assigned to the several species of the disease.

CATHARTICS.

MEDICINES of this class considered generally, are injurious in Cases of Convulsive Asthma, from irritation in the lungs. When they are useful, it must be in that species in which the cause of irritation is seated in the first passages, but in these cases, the Physician must not forget the predisposition to this disease, in every form of which laxity of fibre, or morbid sensiblity, is predominant. There are certain complicated cases in which the propriety of purging is less doubtful; but so many instances of its bringing on a paroxysm are within my knowledge, that I cannot recommend generally any evacuation but the mildest, and chiefly with the intention of discharging the corrupted remains of indigested matters from the first passages. Some practical observations will be offered afterwards, from which it will however appear that there are exceptions to this general rule well deserving the attention of the Physician.

Purging has been suggested as a means of promoting absorption: if ever it can be employed in this intention, without inducing greater inconvenience than it will remove, it must be in Dyspnœa, when the vessels are turgid, but have not yet relieved themselves by serous effusion: this state comes nearest to the second species of Convulsive Asthma, but in this I have not seen purging of any advantage.

The following bolus was taken when the symptoms of a paroxysm had made their attack:

℞ Antimonii Tartariz. gr. i.
Calomelanos gr. iv.
Pulveris Jalapii gr. x.
Conservæ Cynosbat. q. s.
Fiat Bolus.

A similar medicine was taken in another paroxysm in the height of an exacerbation, by the author, who was affected with Convulsive Asthma of the first Species. The paroxysm was not suspended or alleviated in either instance, but it was certainly prolonged in the last.

In another instance of Spasmodic Asthma, Mr. E. T. S. H. took ten grains of powder of jalap, and three grains of calomel, when the fit commenced, which completely removed the fit, on many occasions, by evacuating a load of bile. This difference in the result must convince any reasonable man that the cause was different.

EMETICS.

Some relief has been immediately obtained by vomiting, and this happens generally in cases of Asthma, wherever the irritation may exist. But it is particularly useful when the first passages are loaded with indigested matter, so frequently exciting the paroxysm in the first species, or acting as the proximate cause of it in the third.

Nauseating doses are most useful in the three first species, as they determine the fluids to the surface of the body, and thus relieve the lungs or abdominal viscera; they also promote the absorption of extravasated serum, and exhalation from the lungs, and they are powerful expectorants.

Etmuller and **Baglivi** recommend vomits, and **Floyer** approves of their operation once a month; but a repetition at regular periods is to be condemned, as it may probably tend to introduce in the habit a new rule of secretion.

Other writers consider emetics as dangerous in the paroxysm, but violent vomiting is not generally recommended; and the gentler motions of nausea, with slight puking, are more likely to determine from the lungs than to increase the flow of humours to that organ, as is very justly enforced by Dr. FOART SIMMONS in treating of Phthisis.

In this intention, if the subject be uncommonly vigorous for an asthmatic, Tartarised Antimony, or Antimonial Wine, may be given occasionally. But in general cases, small doses of Ipecacohan are to be preferred. I have, in several instances of the first Species excited strong vomiting at the approach of the fit, but not with that good effect which follows a gentle operation. R. B. took five grains of Tartarised Antimony when the paroxysm had just commenced. After violent evacuations upwards and downwards, with great present distress, the paroxysm was lengthened by several exacerbations more than he had before sustained. Greater weakness in the intermission, and night sweats, were, besides, the consequence of this treatment for several days. But in the Third Species of Asthma, if the fit was excited by bile or acrid matter in the stomach, full vomiting has been known to suspend the progress of the disorder.

DIAPHORETICS.

Neutral saline medicines are given with advantage during the fit of the first species, and also of the second. In the third species they are often useful. In the last they are manifestly hurtful. Whenever they are used, the intention should be to promote a gentle diaphoresis, but not sweating, which is always injurious, and particularly so if forced by heating sudorifics.

In the exhibition of this class of medicines the addition of a bitter infusion or tincture is frequently proper. The stomach should be gently excited and strengthened during the use of diaphoretic saline draughts in most cases of Asthma. Very frequently an alcaline quality should be superadded to the draught, or an absorbent should be combined with it.

BLEEDING.

Many doubts occur on the propriety of bleeding in Asthma, in any species of the disease. Before the pulmonary vessels have relieved themselves by their exhaling orifices, blood may possibly be drawn with some advantage, but when effusion has taken place, a certain debility follows, and a loss of contractile power in the vessels, which prudence will rather submit to during the fit, and attempt to remedy in the intermission.

In this state of the disease, nature pursues the path best adapted to her circumstances; the escape of serous fluid gradually relieves the vessels, and respiration and absorption must be relied on, with a salutary cough, to clear the air-cells of the lymph.

Under considerable evacuations of blood, the sudden depletion of the vessels may leave their coats without the stimulus necessary to produce a contraction, equal to the space which the blood had occupied; the heart will participate in the injury, and will also be deficient in vigour of contraction. If, therefore, blood be taken, it should be drawn from the vessels at intervals, and in small portions, which would allow of a contractile power being exerted, in proportion as the vessel loses its contents, and so much fluid would not finally be taken away as to leave it without the stimulus of distention, so essential to its return of health.

Considering therefore the doubtful effect of bleeding, the operation can scarcely be recommended generally in the First Species of the disease, merely because the suffering of the paroxysm has been lessened in some particular cases.

But bleeding may be considered an imprudent operation in every species of Asthma, unless it be the second. I have repeatedly directed it in the First Species, but I have never had reason to think that the paroxysm was shortened an hour by the loss of blood; and I have often been convinced that the expectoration was delayed, and that more dyspnœa remained in the intermission than was common after former paroxysms. In old people who have been long used to the disorder, it is certainly injurious.

The observations of many old Asthmatics confirm me in this opinion. A gentleman who had the disease sixteen years, (Mr. D. C. in the north of Scotland) had been used to bleeding in the first three years, when his vigour of body corresponded with his age. He says, "though blood-letting "produced a temporary mitigation of the symp-"toms, yet upon the whole his distress was ag-"gravated by a frequent repetition of the ope-"ration." I am in possession of many testimonies to the same purport. If we look back to the old practice, we shall find that blood-letting was much in use. It does not appear that it was answered by cures in the practice of **Floyer** or others. This discharge and purging were often directed at the same time as tonics, an opposition sufficiently explaining why the last were not successful. When there is no real danger therefore from the paroxysm, I think a temporary relief, if it be really obtained, is not worth purchasing at the expence of delaying a cure.

In the second species there are occasionally topical inflammations, which this operation may relieve; but if it be carried far, there is the strongest reason to apprehend that the patient may be plunged into Asthma of the first species.

DIURETICS.

Whether the great flow of watery urine from the kidneys be a critical discharge to relieve the lungs in the first species of Asthma or not, I have never seen the paroxysm shortened by increasing it. The diabetes is also a symptom in the third species, and may be explained from the state of the first passages, which has been described.*

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* Sect. x. xiii.

Notwithstanding these doubts, diuretics have been recommended in Asthma by physicians, antient and modern. **Celsus**[*] says, “ prosunt etiam “ quæcunque urinam movent.”

Hoffman's opinion is thus explained, “In statu “ cachectico, cui jungitur Asthma magnam opem “ ferre deprehenduntur diuretica.”[†] **Rhodius**[‡] asserts, that after the speedy discharge of thirty-seven pints of urine, the disease was cured. **Baglivi** says, “ pluries adnotavimus, in pectoris morbis “ semper ducendum esse ad vias urinæ, natura id “ monstrante.”[§]

“ As diuretics and quicksilver,” says a writer of ingenuity, “ have been famed for their service “ in the Asthma, have we not reason to suspect that “ an anasarca, so obsequious to those remedies, is “ often the foundation of the Asthma?[¶]

Floyer says swelled legs and copious urine are beneficial changes in the Asthma.

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[*] Celsus, lib. iv. cap. 4.

[†] Tom. iii. sect. ii. cap. 2.

[‡] Lib. iii. Obs. 27.

[§] Baglivi, Obs. p. 103.

[¶] Edin. Med. Essays, vol. ii. p. 326.

Whatever species of Asthma may be alluded to in these accounts of benefit from diuretics, I cannot think that any critical discharge is so useful as that by expectoration in the first species. And we are to avoid impeding that event when diuretics are given; squill and vinegar coincide in both intentions.

In experiments with digitalis I have proceeded to a dose which induced symptoms, well known by physicians, to mark the propriety of discontinuing its use; but I have not seen benefit from the exhibition. It has, however, been lately said, on the respectable authority of Dr. PERCIVAL, to have been employed with advantage in Asthma; and the reasoning and experience of Dr. FERRIAR corroborate this testimony of its good effects, when joined to small doses of opium. I cannot say, precisely, in what species of the disease these physicians have used it, as the divisions of Convulsive Asthma proposed in this Inquiry are not referred to.

There are cases of the Third Species in which diuretics are plainly indicated. When dyspnœa remains after the fit, and the urine is at the same time small in quantity, and high coloured, saline diuretics should be given, and mercurials are also then usefully combined, as the case is probably complicated with visceral obstructions.

When the first passages are much disordered, at the same time that the patient's habit is full and not very deficient in vigour, soda, taken every night, in doses of eight grains, has been found very beneficial.

ISSUES.

The antients had always in view the serous defluctions in this disorder, and endeavoured to intercept them descending from the head. This was the indication followed in the cruel practice of ÆTIUS, who had so little ceremony in using the cautery, as to direct fourteen ulcers to be made and kept open at once, between the head and the diaphragm.

In very old Asthmatics issues are sometimes necessary. In younger subjects, when the disease is not yet inveterate, they may occasionally be useful, by diverting aqueous humour from the lungs, and giving a better opportunity for the operation of tonic remedies.

In several instances of young subjects I have directed issues to be healed without the smallest inconvenience, and with a removal of the disorder in some of them, in which if the discharge had been necessary or useful, this consequence could not have happened.

When the disease is complicated with general dropsy, I have seen great advantage to the breathing from their application in the thighs.

ANTISPASMODICS.

Antispasmodic medicines have no certain efficacy in shortening the paroxysm of the first species of this disease. Exceptions may be made to this general remark, but they cannot be founded upon precise distinctions of the different species.

In the fourth species which often appears in Asthmatics, who may be also subjected to exciting causes, occasioning a relapse into one or other of the three former, antispasmodics may be eminently useful. Amongst these opium stands first, but its value is frequently enhanced by the addition of Æther. If these valuable medicines had been applied from a just discrimination of the different species of Asthma, they would not so frequently have deceived the expectation of relief from their use; but such a distinction could not take place till the indication of the convulsive actions being well understood, irritation, under different forms, were considered as the cause to be removed.

Calcined Zinc, which has been strongly recommended, has been found in many trials perfectly inert and useless in the paroxysm. And yet the antispasmodic powers of this mineral have been proved in epilepsy, and the opinion of GAUBIUS on its virtues has been justified by the experience of many other physicians. If it be used in Asthma, it can be only as a means of counteracting the habit of convulsion discovered in the fourth species.

In the intention of removing spasmodic constriction of the bronchia, a numerous list of antispasmodics has been tried in the first species of Asthma, but in general with little advantage.

Valerian, cardamine, camphor, musk, castor, beladonna, tobacco infusion, extract of henbane, fetid gums, cuprum ammoniacle have been given in various doses, more or less joined to other antispasmodic, or tonic medicines, and combined with opium in large and small portions, but in the first species, the paroxysm was not often suspended by any of these agents, though it was frequently prolonged.

In the second species, called the *Dry Asthma*, I have not made so many trials; but I can affirm, that no antispasmodic is so useful in the beginning of the paroxysm of this species as nauseating doses of ipecac, with diaphoretics, in the cases which I have had an opportunity of treating.

In the access of a paroxysm of the first species, R. B. took four grains of solid opium, which produced nearly an apoplectic stupor for two days. After a few hours the most debilitating sickness came on with incessant efforts to puke. The labour of the respiratory muscles abated, but the wheezing evidently increased; a countenance more turgid than usual, and intense head-ache attended. The pulse was more strong and quick for a few hours, but then sunk into great weakness.

The paroxysm shewed itself four hours earlier than usual the next day, and two grains more were taken when it was first perceived; respiratory labour seemed again to abate, but the anxiety increased to an alarming degree, as the stupor became less. The pulse was now weaker, and frequently irregular. Loose motions succeeded, and a general sweat. The energy of the paroxysm then returned with exquisite distress. A medical friend, who attended with great care to the progress of these trials, was alarmed, and endeavoured to promote puking, without effect. Blisters were applied, and draughts of vinegar and pepper were given, interposed with strong coffee and mustard.

The patient was at last brought back to a state more usual in former paroxysms; but with every care there were nine exacerbations before the spitting becoming gradually more copious, concluded the fit.

Notwithstanding the unfortunate result of this experiment, the influence of doctrine, and the weighty authority there is for the existence of a Spasmodic Constriction of the bronchia, induced him to repeat it. He took two grains of opium in another paroxysm after an active vomit, and bad consequences still ensued, though not so considerable. In the latter experiment, the extraordinary symptom of a most painful strangury came on, which continued several hours.

Extract of henbane, which in many cases had proved beneficial, was substituted for opium in succeeding trials, but with no greater success in the beginning, or height of the paroxysm. In the second species this narcotic produced rest, when opium would not; but though the exacerbation was disturbed, the paroxysm was not shortened.

Musk was given twice to a patient in the first species, in doses of half a dram each. A perspiration came out, but the anxiety and laborious respiration were not lessened.—Camphor being added in equal quantity, heat was much increased, with violent head-ache, pain in the stomach, and spastic twitchings in the intercostal muscles, but with no relief to the breathing. Plentiful dilution being used, the extraordinary symptoms subsided. Camphor was also joined with fœtid gums in many instances, without advantage, and where dyspepsia was very predominant, these complicated forms always increased it.

It is in the Fourth Species that antispasmodics are given with the greatest success; and, I have little doubt of their general advantage, when this state of Asthma can be well ascertained to exist. Acids, cordials and volatiles, may be combined in various states of the disease with narcotics. The fœtid gums frequently disorder the digestion, and occasion purging, and whenever these effects appear from using them in the paroxysm, they should be avoided. They may be administered with advantage in combination with other stomachics in states of convalescence to abate flatulence and increase the warmth of the first passages.

Opium and Æther are the most valuable of the class of antispasmodics in this species, and their dose must be proportioned to the necessity of the case. The judicious physician will frequently exhibit them in small doses, with as good an effect as can be obtained from large ones; but this can only happen when the patient has been unaccustomed to their use.

Opiates are often useful and even necessary after emetics and aperients, in cases where these instruments are employed, and are attended by continued or additional irritation of the system.

EXPECTORANTS.

These are a class of medicines useful in the first species of Convulsive Asthma, in proportion to the obstructed condition of the air pipes of the lungs. All practitioners are convinced of the necessity of employing them, and they can only err in prolonging the application of them, or in giving them at improper times.

Myrrh is certainly not an expectorant; and, however valuable as a stomachic, it has been of no use during the paroxysm.

Ammoniac is a very valuable expectorant, but, when given alone, it is sometimes too heating, and may therefore be properly united with a saline menstruum. A composition of this kind, is, however, likely to purge, if not prevented by opium.

Assafœtida, which has been much recommended by Dr. MILLER, is still more heating than ammoniac. He found it most beneficial when it puked the patient, but the disease that he describes is not determined to have been the Convulsive Asthma of adults, and the good effects which are mentioned, have never resulted from its use under my observation. As puking was the effect of the medicine, we may perhaps see, in this operation, the means of relief more than compensating some bad qualities. It is also inconvenient to persons who cannot be contented with a constant fœtor in the mouth, alvine discharges, and the air of the chamber.

The oily and demulcent expectorants, are not calculated to do good in any species of Asthma; the stomach of an Asthmatic is always disposed to be disordered, and would be more so from the use of any greasy and relaxing medicine. According to my experience they ought never to be administered in the paroxysm, or the intermission of the disease.

Squills may be made useful in the two first species of the disease. When united with vinegar, we obtain the medicine on which FLOYER bestows the greatest applause. In many trials I have seen great advantages from vinegar of squills, in the first species of Convulsive Asthma. It is most useful at the commencement of the paroxysm, and then in proportion as it is attended with some little nausea without diarrhœa. However much it may promote urine, this effect seems not to shorten the paroxysm of Asthma, whilst its other powers have increased expectoration, and probably excited absorption. In using squills we must keep a watchful eye on the state of the bowels, as purging is a very common effect of this medicine, and should never be permitted to gain ground from accident or neglect in Asthma, unless it be complicated with disorders of the abdominal viscera.

Tincture of squills combined with extract of henbane and the nitric acid, has been proved by much experience to be expectorant and sedative in the paroxysm of the first species, although each article uncombined had been given without success.

Vinegar of squills is also a good medicine in the second species, but I have remarked, that its power over the paroxysm is then only in proportion to its emetic, or nauseating effect. In the third species, unless it vomits, I can see no use in the employment of it.

Oxymel is only efficacious, as it contains vinegar or squill. Honey and sugar are too fermentable for any species of Asthma, and frequently impede the operation of better medicines: and yet, these substances are popular applications whenever cough or difficulty of breathing attends. They cannot, however, be too carefully abstained from in Asthma.

Decoction of seneka is eminently useful in the first species, administered to old people, but in the paroxysm of young persons, I have found it too irritating. This distinction applies to Convulsive Asthma, purely uncomplicated, but the disease is frequently observed in middle-aged, and elderly persons, to take the character of peripneumonia notha in the winter and spring, and seneka is then the most certainly useful medicine that I have tried. In such cases it should be united with acetated ammonia during the febrile state, and as this state gives way, the addition of squill and camphorated tincture of opium, will be found to promote expectoration, perspiration, and urine in a powerful manner.

Whenever expectorants are prescribed in Asthma it should be recollected, that the state of the stomach requires amendment. Nauseating doses may often answer two intentions; as their first effect may be a removal of the offensive matters, which will be gradually passed forward from the stomach and the duodenum, and absorbents, with bitters, may then be pursued with greater advantage: the second effect may be a relief of stricture in the chest, and the favourable excretion of phlegm.

Blisters between the shoulders are not of very decisive use. They have been generally accompanied by medicines which might promote expectoration without them, and the usual course of the paroxysm is not shortened by their application.

INHALING VAPOURS.

Hippocrates introduced the inhalation of vapours from various herbs, and resinous gums. He used herbs and nitre boiled with vinegar and oil, and directed the vapour of such boiling compositions to be drawn into the lungs through a proper pipe. This practice was extended in many directions, and upon various indications of disease, as appears from many parts of his works.

Upon the indication of excess of serum, fumes were directed to be inhaled by practitioners, many ages after his time, for the purpose of drying the moisture which was the cause of Asthma, and also to carry off the remains of the obstructing matter. Frankincense, myrrh, and many other gums, were in common use, with which arsenic was occasionally mixed very injudiciously. But this application of the mineral, arose from the mistake of taking the gum juniper or vernix of the Arabians, which, by their medical authors, was prescribed in fumigation, under the name of sandarac, for the σανδαράχη of the Greeks, which, doubtless, was an arsenical mineral.*

The inhaling of fumes has also been suggested by modern physicians, both in Phthisis and Asthma, The vapour of æther, raised in the steam of warm water, has been often inhaled from the instrument recommended by Mr. Mudge, but without positive advantage in Asthma. In the first species the symptoms have been aggravated by its use, from its occasioning, as we may presume, a greater rarefaction of the air contained in the lungs, and a more considerable expansion of the fluids in the pulmonary vessels.

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* Vide Galen, Lib. IX.

The vapour arising from hemlock leaves infused in boiling water, was once found serviceable in the second species of Asthma, but always injurious in the first. In the fourth species its narcotic quality may be supposed to recommend its use; but antispasmodics directly taken into the stomach will act with more decision, and render other means unnecessary. If there be virtues in some herbs, calculated to promote expectoration, the vehicle of aqueous vapour is not favourable to their operation; heat and moisture conveyed into the lungs being more likely to increase the disease than to give relief.*

The *smoaking* of narcotic herbs serves to relieve spasms in Asthma, but may injure the patient's health.

In the use of tobacco Asthmatics sometimes mistake the great secretion of saliva for a necessary evacuation. I am satisfied that a much more copious determination of lymph is made to the bronchia and salivary glands by smoaking, and it will be entirely conformable to the rules of the animal economy, if the habit of such secretion be confirmed, though this exciting cause be absent. I have persuaded some Asthmatics attacked with the first species to abandon the practice, with great advantage to their health. The system cannot obtain the necessary supply of oxygen, sufficiently fast in this species of the disease, even if the disoxygenating property of tobacco fumes be not employed.

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* The inhaling the vapour of radical vinegar from a glass vessel has been well recommended. The process and vessel are described in Vol. III. of Dr. Duncan's Annals of Medicine.

The practice of smoaking the herb stramonium may be considered in the same light as the inhaling the fumes of tobacco. But more serious objections apply to the indiscriminate use of stramonium, which will be mentioned afterwards.

Oxygen, Hydrogen, Hydro-Carbonate.—Those who are best acquainted with pneumatic medicine have spoken in sanguine terms of the effects of oxygen in Asthma. “No sooner does it touch “the lungs,” says Dr. BEDDOES, “than the livid “colour of the countenance disappears, the labo-“rious respiration ceases, and the functions of all “the thoracic organs go on easily and pleasantly “again.”

Many authorities confirm the fact of benefit having been derived from the inspiration of oxygen gas in Asthma, but as there has been hitherto little distinction of the causes of this disease, pneumatic medicine has been often tried from random indications; and hydro-carbonate and hydrogen have been said to be useful in Asthma, as well as oxygen, though their properties are so different.

We have an account from Dr. FERRIER, of undoubted benefit from the use of hydrogen in Spasmodic Asthma, but the disease is said to have taken place after inflammations in the thorax and adhesions of the pleura: should it not, therefore, be included in the continued species, from fixed causes? In a case of this kind, oxygen would probably revive pain and inflammation by its stimulating properties, opposite to those of hydrogen, which last could not be a permanent remedy.

I have no doubt of temporary advantage having been experienced in some cases from using oxygen in the paroxysm of the first species of Convulsive Asthma; but I cannot expect a cure from the continuance of this remedy only in the intermission, though, here too, it may be expected to aid the general means.

Cures, from the agency of the gases and the fumes of narcotic herbs are to be found in periodical publications; but the terms in which they are reported, and the descriptions of disease to which these cures are applied, are insufficient to convince the experienced reader of their reality by whatever sanction they may be supported.

I am well acquainted with the return of the disorder in several instances, after the most favourable expectations had been entertained, from the relief afforded by inhaling oxygen in previous paroxysms.

In the second species of Asthma, I am informed by a Physician of great accuracy and discernment, that oxygen appeared hurtful, increasing heat and anxiety, and producing temporary fever, when the pulse was previously under 90. Hydrogen and hydro-carbonate were successively tried without benefit, and the fit vanished at last by the patient moving out of town.

In a case where the first passages were affected with dyspepsia, and the greatest debility, oxygen was usefully inhaled, though I cannot say what length of time was required to produce the good effect. I was informed that the Convulsive Respiration appeared to belong to the third species; and that the patient enjoyed a better appetite and suffered less in the paroxysm from the inspiring of oxygen, than he was used to do before he applied to it.

It is not always possible to ascertain if the irritation of serum existed in the lungs or not, in the third species, when much acrimony may have been present in the first passages, and have had a decided influence in bringing on the fit.

But if oxygen be really a remedy for dyspepsia, it may be useful in the third species, by invigorating the arterial and absorbent systems, and thus, eventually promoting peristaltic action, and a better assimilation of alimentary matter. It has been rendered probable by M. HALLE, that oxygen is principally instrumental in performing those combinations in the intestinal canal by which assimilation is produced.*

That oxygen may be useful in a paroxysm of Asthma, from the irritation of mucus, appears probable from the circumstances of predisposition to this disease, and still more from its proximate cause.

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* See La Medicine Eclairée, &c. par M. Fourcroy.

If oxygen be inspired, it may act directly upon the capillary orifices, and excite them by its properties to contract their apertures, and thus prevent the further exit of their serous contents. If its stimulating qualities were to be applied to the arterial trunks only, they might propel the blood with unusual force, and the capillary extremities not being equally excited, the disease might be increased; but in speaking of this diffusible and subtle fluid, we cannot apply the same reasoning as to other agents, operating upon the powers of life; we are to consider that it is a necessary constituent of the blood in its healthy state, and we are assured that there are facts which prove that it possesses some degree of influence in mitigating the distress of a paroxysm of Convulsive Asthma.

We are also to consider that it may be made to penetrate more extensively and deeply, into the air cavities, by being inspired in greater proportions than can be afforded by a common atmosphere, so that the points of vascular texture, uncovered by mucus, may be exposed to a greater influence, though they be fewer in number, than in the healthy state of the lungs.

We are led to infer from these premises that the application of oxygen gives to the pulmonary vessels, and to the heart itself, a vigour which enables them to send the blood more freely to the left ventricle, and that the anxiety and straitness, are in proportion diminished: but it is carefully to be remarked, that the expectoration in a greater or less degree still terminates the fit in the first species, which comprehends so large a majority of the cases of Convulsive Asthma. See Sect. IX. for additional reflections upon its use.*

STOMACHICS.

These remedies are absolutely necessary in Asthma to correct dyspepsia, in whatever species of the disease it may appear. Bitter tinctures are not to be used in the paroxysm, but bitter infusions and testaceous powders are generally beneficial.

The acetous acid is also particularly grateful to the stomach, when any bilious acrimony is present. In this case the irritating cause may be altered in its property by acids. Acids appear also to stop the tendency to fermentation, at the same time that they excite absorbing action and invigorate the organ. It is obvious, that cretaceous powders should not be exhibited at the same time, but it is fully confirmed by experience, that both eminently counteract the flatulence and distension, when they are administered separately in suitable circumstances.*

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* See the Rev. Mr. Townshend's Guide to Health, Vol. I. for further evidence of the use of oxygen in Asthma.

Medicines of the stomachic class that possess stimulant, or heating properties, are out of place till the third day, when the patient usually begins to mend in the first species. Generally speaking, after the third day of the paroxysm, any particular bitter, or cordial stomachic, will be useful in all species of simple Asthma.

The mixture proposed by Dr. Griffiths, of myrrh, kali, and vitriolated iron, is a stomachic, of great use between the fits, when the predisposition is to be cured; but it ought not to be given, until the intermission is well established.

Vinegar has been found most useful in the paroxysm of the first species. In the access of the fit it may be united with squill or ipecacuanha, to produce puking. Afterwards, according to the progress of the complaint, and the violence of the spasms, æther may be added in the first and the third species, but in the second it is too heating. When opium is given, it may be united with this acid, and also with æther and tincture of squill, if there be an urgent necessity of expectoration.

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* What these circumstances may be, deserves serious consideration. I shall endeavour to point them out hereafter more particularly.

The acetous acid would have been found much more useful than it has appeared to be in this disorder, if it had been less combined with saccharine and acescent substances. I have seen the paroxysm, in the first species, relieved by vinegar, simply united with water, when oxymel was useless or injurious.

The effect of this acid upon the lips, which it renders pale and shrivelled, seems to discover *a priori* a quality likely to stimulate the absorbing vessels to increased action; and it is thus that its operation in Asthma may be partly explained: there may be also other reasons for its good effects, which will be presently attended to.

M. ACHARD* found, by experiment, that vinegar of all solid or fluid perfumes, phlógisticated the air the least.

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* See Journal de Physique, par M. L'Abbe Rosier, tom. 26.

The beneficial use of chalk in Asthma seems to arise from the great disorder in the secretions of the first passages, accompanied with an acid acrimony and a deficiency of bile to correct it. I conclude, that the capillary orifices of the stomach pour out a fluid in too great quantity, in consequence of its coats being morbidly relaxed, in which state the juices may immediately at their separation possess a vitious quality different from that which is necessary for the digesting process. The secreting vessels may then demand some appropriate astringent to excite their contractions. Whether chalk answers this last purpose or not, is doubtful, but we may attribute to it the property of an absorbent, and it is as advantageous in Asthma of the first and third species, and occasionally in that of the second, as it is in diarrhœa.

It has not, however, been generally the custom to use absorbents, because Physicians have hitherto merely considered difficulty of breathing as a state only connected with the lungs, without referring to other causes either original or secondary, which might induce the symptoms.

In the third species, when the disease was caused by dyspepsia only, chalk has very frequently produced admirable effects; it should be first given in a neutralized draught, after a gentle puke. An aperient of rhubarb should be interposed, and after two days, opium being added, will sometimes prevent another exacerbation. I have seen this effect produced on the second day, but not without a previous evacuation from the first passages, and a very free use of chalk.

STIMULANTS.

The stimulants which have been so generally used in practice within these few years, have been applied in all species, and all stages of Asthma. In the paroxysm of every species in which the cause of the irritation was not discharged, they have frequently done mischief, and not uncommonly induced the necessity of bleeding, which has been erroneously attributed to the natural course of the disorder.

I have never yet seen æther give relief in the height of the paroxysm of Convulsive Asthma of the first species. In many instances the anxiety and the labour of respiration were certainly increased by it. If the irritation arise from repelled gout, the case may be more susceptible of benefit from its use, but this case should be distinguished from those of disorders in the alimentary passages which cause the paroxysm in the third species.

The acrimony of indigested aliment, offending the stomach and duodenum, has certainly produced, in many subjects, the reaction of the system in a paroxysm of Asthma, which should be classed in the third species; but in this case saline absorbents are infinitely to be preferred to the hot and stimulant draughts of volatile salts, æther, and fetid gums, the bad effect of which is too often only diminished by the rhubarb or aloes which are fortunately admitted in the composition.

In the paroxysm of Convulsive Asthma, a writer of great ingenuity recommends a tea-spoonful of æther three or four times, to which he adds ten drops of laudanum. We have likewise a direction to apply a blister, to give an emetic, and to bleed. It is difficult to say what natural symptoms of the *same disease* can indicate such contrary remedies; and we can only be satisfied by reflecting, that Convulsive Asthma has never yet been referred to its distinct and characteristic causes, and that the indications may in one species call for a medical agent that cannot be applied in another, in which, even one of an opposite quality may be required.

In saying this, I endeavour to account for the success which may occasionally attend on each plan; as, from my knowledge of the abilities of Dr. DARWIN, I am disposed to confide fully in the judgment of his directions.

But though stimulants may be misplaced in the paroxysms of three species of Convulsive Asthma, they may be used with advantage in the fourth, if joined with opium, and possibly other narcotics.

They are also occasionally beneficial in the intermissions of the first and third species, as a means of exciting digestion, and the general powers of the habit, particularly of the absorbing system. The intention in which they are to be given will determine the Physician in his choice.

BATHING.

Warm bathing is hurtful in every species of Asthma. Not contented with probability, R. B. went into the hot bath both in the intermission and the paroxysm. The distress in breathing was much aggravated by the trial in the last state, and the paroxysm was excited in a few hours, and at an unusual period, by the trial being made in the intermission.

The cold bath has been recommended in Asthma by many writers. I believe there is no single remedy of more value in all species of the complaint, excepting in certain cases of the Third Species, during the *absence of the paroxysm*. I can assert this after numerous trials of its efficacy, in the First Species of Asthma, and from frequent observation of its effects in the Fourth.

In the paroxysm, R. B. went into a cold bath of a lower temperature than fifty degrees of Farenheit. It required some firmness to make the attempt, and great patience to bear the want of success attending it. The sudden abstraction of heat was evidently injurious; and it was some hours before the impression was so far overcome as to take away fears of the consequence.

But notwithstanding the objection which careful experience may urge generally against the use of the cold Bath in the paroxysm of Asthma, there are instances within my knowledge of this practice having been pursued with sensible feelings of relief. The patients were persons of more constitutional vigour than generally belongs to Asthmatics.

TONICS.

Tonic medicines, if we separate a class of stomachics from this general head, cannot be reasonably expected to be useful in the paroxysm of Asthma. They have been applied partially in the general practice, and abandoned capriciously in cases of Asthma, during the intervals.

But a desideratum has always been a proper distinction of specific causes. If tonics be given in cases of disordered respiration arising from secret vomicæ, adhesions of the pleura, and many other causes of Continued Asthma, what consequence can be expected, but an increase of the disease? The recollection of every Physician will enable him to allow, that instances of this complicated kind have been confounded more or less with Convulsive Asthma of nosologists; and when iron, or other tonics have been exhibited in such cases, these valuable medicines have met with unmerited disgrace.

But, besides this cause for the rejection of tonics, the want of firmness in continuing the use of them, when properly indicated, is a great source of their discredit.

If a febrile affection come on during a course of steel or mineral water, the medicine is probably entirely discarded.

Peruvian bark may have loaded the stomach, and brought on dyspnœa in one preparation; it is then abandoned without trying another of lighter digestion, and more divided parts.

I can affirm, that in the intervals of the paroxysms of the first, third, and fourth species of Asthma, tonics are generally beneficial: and I am of opinion, that a temporary inconvenience from the use of one form, should incite the Physician to find another, and apply it, never abandoning the general intention.

In the second species of Asthma, their advantage is more doubtful, and their exhibition can only be decided upon after a careful attention to remote causes.

In pursuing, consistently, a course of tonic medicines in this disease, the Physician should prepare his patient for the necessity of a long perseverance. A predisposition is to be cured which consists radically in laxity of fibre, and which is consequently attended with feeble vascular contractions.

The debility of the vascular system is particularly productive of a languid circulation in the lungs and liver. A feeble and slow circulation in these organs has been sufficiently pointed out as the cause of serous effusion, or of such a turgid state as may occasion difficulties of breathing, forming a paroxysm of Asthma or a disease of a chronic character. This existing state seems to have caused that apprehension of tonics which has generally prevailed amongst Physicians in the treatment of Asthma. But the state now described is that of *passive* weakness, and not *active* tone or inflammatory disposition. It requires therefore an appropriate treatment which has not been usually applied.

This state has been growing very probably for years, and the expectation of removing it in as many weeks, or even months, is puerile, and ought not to be encouraged.

It would in fact be nearly as rational to promise, that a remedy shall give to the soft muscle of an infant, the density and tone of adult growth, as to engage a speedy change in the habit of an Asthmatic who has for several years suffered the First Species of Asthma.

In the first species of Convulsive Asthma, the

Physician may be safely referred to all medicines which belong to the class of tonics, which may be taken up and suspended, or variously combined, according to his judgment. A long use of one form diminishes its influence, whilst the application of another will continue the impression with greater effect.

In the choice of tonics, the preparations of iron are to be preferred, as essential means of cure. These should be frequently assisted by bitters, and in some circumstances by Peruvian bark. At the same time the state of dyspepsia is never to be overlooked, but must be obviated by the frequent interposition of absorbents and rhubarb. Opium is also required occasionally to tranquillize the uneasiness arising from the new excitement of the preparations of iron. Oxygen has been recommended upon principles closely connected with the predisposition and remote causes of Asthma, and may be applied by modes of exhibition now generally known.

The author has tried calcined zinc in numerous paroxysms and intermissions, without having been able to discover the smallest advantage from its operation. In general it loaded the stomach, when given in a full dose. The accounts we have of its efficacy must be assigned partly to enthusiasm, and more generally to the want of discrimination of the species of Asthma, and the erroneous interpretation of the causes which terminate the fit. These are more or less dependent on the density of the atmosphere, and changes in its degrees of purity, and frequently on the condition of the first passages, hitherto greatly neglected in treating the disease. So that the termination of a fit of Asthma may be expected after a time from changes that are not effected by medicine, but by accidental influences or the natural course of the disorder. This applies to the paroxysm of Asthma, but unfortunately not to the disease of constitution in which it takes place.

SECT. XVI.

A plan of treatment proposed for the PAROXYSM of each species.—RULES OF DIET for the Paroxysm and intermission.

IT affords no very satisfactory reflection, that in attempting the treatment of the Paroxysm we are not conducted by any rules that have been applied with certain benefit in a series of similar cases. What has been done by one Physician, has not been attended with equal advantage in the practice of another. A new medicine will not uncommonly afford relief, and create a sanguine hope in the sufferer that he possesses an instrument on which he may always depend for succour. This possible advantage has not, however, been yet connected with rules of practice, that may be applied to other instances; no inference from past success can, therefore, be extended to the future, unless from the previous treatment and persevering care, the disease have arrived at a less capricious stage, and assume the character of the Fourth Species, in which antispasmodics are so decisive in their effect. The Third Species also affords a better prognostic when the Paroxysm can be referred to causes of fixed Irritation in the first passages, or to a turgid condition of the liver.

But in the First Species, which comprehends so many Cases, and in the Second Species we are not advanced in the art of suspending or removing the Paroxysm, although infallible cures of the disease have been so frequently offered for our direction. I shall, however, present the observations which experience has suggested in treating the Paroxysm of each Species.

In a paroxysm of Convulsive Asthma, we are first to consider what species of the disease it belongs to, and next the indications which are to direct us in the treatment.

PAROXYSM OF THE FIRST SPECIES.

The indications are to lessen the distention of the pulmonary vessels, by determining the blood to the surface of the body: to accelerate the passage of the blood from the right to the left side of the heart: to remove the extravasated serum already present, by absorption, exhalation, and mucous expectoration: to correct dyspepsia, and increase the tone of the first passages.

In answering the indications of every species of Asthma, we are to employ the instruments proposed in the last section, with the practical cautions there recommended.

By gentle puking we may obtain some knowledge of the state of the first passages, and the paroxysm will go on with milder exacerbations, if irritating matter be removed from the stomach and duodenum. Afterwards a draught with one ounce of distilled vinegar, and from one to three grains of pulv. ipecac. in pure water, may be taken every four hours, as a means of determining to the surface of the body, and promoting absorption and exhalation. If costiveness prevail, it will be necessary to remove it, by the use of rhubarb, or infusion of senna, but we must carefully avoid purging.

Instead of the acetous draughts with ipecac. the Physician may have reason to prefer chalk or magnesia usta in a draught of mint water, with the same nauseating ingredient. The evidence of disorder in the first passages will determine him in his choice.

It has happened in several instances, after various means intended to mitigate the distress of the fit had failed, that the rubigo ferri, or Carbonate of Iron, in doses of ten grains every four hours, appeared most clearly to remove the paroxysm. This effect can only, I think, be accounted for by looking to the inert condition of the stomach and lungs, and to the languid state of the circulation in the thoracic and abdominal viscera. Whatever in such circumstances can hasten the passage of the blood through the lungs, and promote a quicker return to the heart from the lower viscera, must be useful in the intention of present relief, as well as of actual cure.

Wth this view of the real state of the thoracic viscera, and to accelerate the passage of the blood to the left ventricle of the heart, oxygen may be inspired, diluted according to the rules of Dr. **BEDDOES**: but the Author of this Inquiry cannot, from his own observation and experience, promise any useful result from this practice.

In the morning no time should be lost in supplying the patient with clear coffee, as soon as he awakes, which should be repeated at intervals with dry toast.

The patient may also take coffee often during the remission or an infusion of columbo root, or chamomile, with a few drops of tinct. opii. every three hours, the nauseating draught being suspended between the exacerbations.

At the beginning of the second exacerbation the nauseating draught should be repeated, at first with a sufficient proportion of ipecacuhan to excite puking, and afterwards with a less dose that may only occasion nausea. In the second remission, the plan pursued in the former should be resumed.

The third exacerbation will probably be mild, so that the ipecacuhan draughts may be suspended or they may be united with æther and tincture of columbo in place of the ipecacuhan. With this plan there will appear on the third day a considerable tendency to expectorate, which should be promoted by ammoniac, and vinegar of squill with tinct. opii, or with volatile salts. Ammoniac is called an expectorant, but the patient before this period, too frequently takes this nauseous medicine without use.

From this time, bitter infusions, of myrrh, or columbo, or the infus. gentian. compos. may be given with great advantage, more or less united with absorbent earths, or magnesia. If the exacerbation still return in the evenings, it may be proper to continue the nauseating medicine at the hour of its attack, except in Asthmatics, who from having frequently sustained the paroxysm, may probably be chiefly influenced by habit. When this is ascertained a considerable dose of opium, with æther and volatiles, is the specific remedy.

This plan may be modified as circumstances require. But without respect to difference of habit and peculiarity of disease the Physician is sometimes obliged to act promptly and to find a new remedy.

In many paroxysms of the First Species, I have prescribed a form that is entitled to a preference, as being most likely to produce the desired relief. Many patients, who had taken the most powerful antispasmodics, have assured me that none had been so useful; and two Gentlemen now under my direction, inform me, that it is the only medicine that had ever given them relief in the paroxysms.

℞. Tincturæ Scillæ. gutt. x.
Acidi Nitrici, gutt. vi.
Extracti Hyoscyami gr. tria.
Aquæ puræ ℥iss, m.

Fiat haustus horis tertiis vel quartis durante paroxysmo repetendus.

This medicine should not be used too familiarly, or in slight affections of the breathing, as the extract of henbane might thus lose its force, or debilitate the patient. The nitric acid appears to counteract this tendency, without taking from the power of the sedative. And the tincture of Squills forwards expectoration when the breast is prepared for this relief.

PAROXYSM OF THE SECOND SPECIES.

The indications are to discharge the subtile and acrid particles which have been received in inspiration, or to promote such a secretion of lymph as may envelope them, and thus defend the membrane from their further irritation: and lastly, to remove the patient from the influence of these causes.

The first intention is not readily accomplished by art, and whatever claims may be made to the credit of curing paroxysms of this species, nature is often the patient's only friend. The irritating offence will naturally increase the action of the bronchial vessels, their lubricating lymph will be secreted to sheathe the passages from further injury; and this event frequently takes place without any thanks being due to medicine; it may, however, be promoted by saline and antimonal diaphoretics, and nauseating doses of ipecac. adding tinct. opii, when the paroxysm declines.

A change of the wind may likewise save the patient every trouble in executing the last intention, but if this relief do not come, it will be necessary to direct a different residence.

PAROXYSM OF THE THIRD SPECIES.

The indications are to discharge irritating matter, or to remove obstructions, from some of the viscera below the diaphragm.

The diagnostics, it must be confessed, are here often difficult to ascertain. But if the case do not belong to this species of Asthma, we must assign it to the first, and the same preliminary treatment may be safely pursued. After one gentle emetic, an opinion may be formed with more certainty whether pulmonary irritation be present as well as abdominal, which may be discovered by the cough that attends in both; and also from the measure of relief which is obtained by emptying the first passages. In the first species the cough is so small and painful as to be suppressed by voluntary efforts. In the third it is more open, but equally without expectoration, as in the beginning of the other.* An acquaintance with the state of the patient in his previous intermissions is the most certain guide to a knowledge of the cause of the fits.

The considerations, analogies, and facts of Sect. XIII. may direct the inquirer further in settling the diagnostics of this species.

As we consider this species to depend much on disorders of the lower viscera, the turgid state of the liver may be a frequent cause, both creating dyspepsia, and following it. It may be therefore necessary, in some cases well understood from former circumstances, to give crude quicksilver triturated into a bolus with conserve or calomel with rhubarb. But generally we are to pursue the most gentle means of discharging acrimony, or altering its qualities, whilst the paroxysm lasts.

In executing the first of these intentions Rhubarb or Infusion of Senna with tartarized kali, or Ol. Ricini, or Magnesia, may be the best instruments as acting effectually in the most quiet manner.

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* See remarks on the Third Species in the next section.

To alter the qualities of the acrimonious matters in the first passages, we may employ acids or absorbents. If a bilious state of the stomach and duodenum be clearly marked, not only the acetous acid, but even the mineral acids much diluted are very proper. No saccharine acids or acescents will answer the purpose in view, in the asthmatic habit; for if it be the alcaline property of the bile that offends the irritable system, through the medium of the digestive organs, we must still abstain from giving the slightest cause for the increase of dyspepsia. On this account the stronger acids, which at once neutralize bile and excite the secreting surface of the organ to a better action, must on all occasions be preferred. If, on the contrary, acid or acescent matters prevail most in these passages, the consequence of a vitious secretion, or merely of a weak and disordered digestion, then testaceous or cretaceous powders may be more or less mixed with saline or bitter draughts; and in the same cases volatile and fixed alkalies may be made useful.

After a sufficient evacuation, if the habit of convulsive contractions be of long standing, an opiate may be given with great propriety; but in young Asthmatics, if the offence existed only in the alimentary canal, the paroxysm may be suspended, or the exacerbation be rendered so mild by this evacuation, as not to distress the patient.

Whether this state be obtained by the operation of an opiate or not, absorbent earths are eminently useful, and should afterwards be continued through exacerbations and remissions, in a vehicle saline and bitter, and opium, with or without æther, may be added, as the judgment of the Physician may direct, under a due regard to the distinction of the qualities of the acrimony just pointed out.

PAROXYSM OF THE FOURTH SPECIES.

The indications direct us to make sensation less acute, or by varying impressions, to break the chain of perceptions, connecting themselves in the mind with the primary cause.

To be correct in discriminating this species, is not always possible; but that there is reason for the establishment of it, is proved by the analogy of all convulsive contractions; by paroxysms returning upon such minute causes of offence, as to be traced with difficulty, and at last only through the links of mental association of ideas.

Here we see the use of opium and other antispasmodics; their influence on animal sensation prevents the effect of slight irritations, which, though not likely to endanger a function, might excite muscular convulsions, if these medicines were not administered, in habits which we have endeavoured to distinguish.

It has been shewn that this species may supervene upon each of the former species of Asthma. Nature or art may have removed the irritating offence, but convulsive motions may still continue, at greater or less intervals.

After a patient has suffered the First Species or the Third it may be pretty well concluded, that the recurrence is owing to habit, if he be considerably improved in health, if dyspepsia be entirely removed, and if expectoration and wheezing do not terminate the fits.

But no diagnostic can afford so clear a distinction as the effect of medicine. According to circumstances, opium and æther may be employed in large doses, and in the alteration of symptoms which has been described, these antispasmodics are in many cases instantly useful.

DIET.

The Asthmatic should avoid the Errors in Diet which have been already pointed out as exciting causes in Sect. IX. His food should not be generally fluid or weak. In the second species there is the necessity of a perspiring state of the body, but the stomach requires solids, even in that. Malt liquor should be avoided, both in the paroxysm and intermission, of every species of Asthma. Watery gruels and broths are as bad as malt liquors, if taken largely. Whatever is stomachic is proper, if it do not stimulate overmuch. Acidulated water, milk and ginger tea with toasted bread, or biscuit, rice boiled in broth, till it be soft, without fat, are more suited to the paroxysm, than liquids merely diluent. Barley water and all weak liquors that are likely to ferment or relax the stomach should be abstained from. On the contrary liquors of an aromatic or stomachic quality are generally required; and ginger tea, or infusion of camomile or of Seville orange peel, may be made agreeable and useful in this intention.

Infusion of coffee may be considered as medicinal in every species of Asthma except the second, in which it is too heating for common use. It is best applied in the first and third species, in both which dyspepsia is so predominant, as to make the general treatment of one not inapplicable to the other. Sir J. PRINGLE speaks of coffee in the paroxysm as a most powerful medicine, and he directed it to be taken in the proportion of one ounce to a dish, without mixture, and to be repeated every half hour. Dr. PERCIVAL gives his authority for the use of coffee in Asthma, as a successful means of relief. Sir J. FLOYER used it with great benefit in the latter part of his life, as appears from the account of Dr. MUSGRAVE.

If coffee be boiled, it loses part of its flavour; it should, therefore, be infused like tea, by pouring boiling water upon it in a close pot. See Count Rumford's 18th Essay, on the making of coffee.

From the end of one exacerbation to the beginning of the next, a more cordial aliment may be used, but not so exciting as in the intermissions of the paroxysms. Coffee and ginger tea are the most cordial articles which should be allowed. Hot liquors are always improper; cold water is frequently taken with great benefit, and if acidulated with vinegar or with vitriolic acid its good effects are often more considerable.

Pure cool water has frequently removed the bad effect of an imprudent meal. If the Asthmatic perceive his stomach to be disordered or uneasy, he may next expect more certain symptoms of a paroxysm. In these circumstances I have experienced, very frequently, the advantage of repeated draughts of water, so that two or three pints have been taken in the whole, from the commencement of the uneasiness; and this has given perfect relief when coffee had failed. But this large potation of water will not answer in every instance. It is often necessary to mix with the water a proportion of brandy.

It is certainly very injurious to eat more than the stomach can govern: but it is not less important in an advanced state of the disease, to supply it with tender animal food and light wine. A specimen of clear advantage from the cordial diet is given by Dr. WHYTT.* And the necessity of a critical attention to the state of the stomach, with evidence of the influence it may have on Asthma, appear from the experience of Dr. WOLCOT. This ingenious Physician and Poet proved the fact personally, that it was necessary to take animal food frequently, but sparingly. He generally quitted the table with an appetite. He was obliged to abstain from vegetables; and he experienced great distress in respiration, if he fasted many hours, and then made a hearty meal.

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* Observations, &c. on the Cure of Nervous Disorders, p. 502.

The practice of taking rich soups and broths, is very injudicious in all stages of Asthma. The vessels are both filled and relaxed, and the stomach is not improved by the use of these articles.

The cautions as to Errors of *Diet*, which have been given at large in Sect. IX. should be observed as practical rules. But there is the utmost difficulty in maintaining the regimen which is necessary, however prudent the patient may be in his own opinion. If the necessity of a strict abstinence from indigestible substances be acknowledged by the Asthmatic, his varied temptations, and the particular circumstances of his pursuits, continually counteract the plan, and so far nourish the disease. If habits of intemperance have been long established, there is often much evasion of inquiry, or concealment of errors of this kind, which make an additional difficulty, and render all calculation on the result futile, as in the following instance:

CASE.

A young mân had suffered Spasmodic Asthma eight years. He had been a very free liver, and had drunk malt liquor in large quantities. His first complaints were in the stomach, which had been long disordered with wind and uneasiness before he had a fit. He had almost constantly the heart-burn; and when this was worse than usual, a fit followed with great certainty. He was of a strong make: his pulse was regular, and he coughed and spat but little.

I prescribed pills of rubigo ferri, rhubarb, and pepper, to be taken night and morning, with elixir vitrioli in a glass of water. I also ordered pulv. test. ostreorum, and magnesia utsa, to be taken in peppermint-water at dinner time. He was restrained from malt-liquor, but allowed a small portion of spirit in his water.

After I had seen this patient once only, a surgeon, in whose judgment and accurate observation I had great confidence favoured me with the following account: " He is very unwilling " to allow that he received benefit from the medi" cines and regimen which you prescribed, except " that they cured him of the Cardialgia; but as this " evidently preceded, or accompanied every Asth" matic attack, and as he was actually during the " three weeks of six, in which he took the medi" cines, *entirely free* from any disease of respiration, " and continued so with very little occasional " disturbance for as much as two months after this, " I have myself very little doubt, but if he had per" severed in the *regimen*, and only occasionally had " recourse to the medicines, they would have effected " a radical cure."*

He then adds some particulars, which shew the intemperate conduct of the patient, and its influence, in bringing on the paroxysm. " He has " now a fit upon him, which has continued with " very little intermission for three days, and was

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* I afterwards saw this patient more frequently for a short period. He then received great benefit from soda water; and considering his strong habit, I should in a similar case at the present time rely on soda and rhubarb as the best means of cure if persevered in daily for a long time.

" certainly brought on from the over-night's boun-
" tiful ingurgitation and probably inebriation with
" spirit and water."

If in difficulties of this kind terms can be made that meet the object part of the way, it is all that can be done in respect to intemperance in diet. Intemperance may yet shew itself in the garb of regimen. When it is proper to add brandy to water, the proportions are frequently forgotten, and it becomes necessary to prescribe the number of ounces of spirit, that may be mixed with proportions of water, in a certain number of hours. This mode may eventually furnish the means of progressively diminishing the quantity of spirit, until pure water, the best of friends to digestion, when the stomach is in its natural state, be used alone.

The glutinous quality of malt liquor and its tendency to go into fermentation, make it improper in all cases of difficult breathing. Milk is liable to the same objection, however salutary if it can pass the stomach. Ginger cannot be too freely used, as an article of diet. This may obviate many of the inconveniencies which have been suggested, at the same time that it gives strength to the organs of digestion. I mention Ginger in this place, as it may be proposed to the incautious patient to supply his stomach with heat and a sense of stimulus, which it may require from the habit of drinking spirits.

SECTION XVII.

The Predisposition removed, and the disease cured.—Successive appearance of the Symptoms.—Observations on the distinction of the Species.—Examples of the Practice in each of the Four Species.—Cases and Remarks.—Conclusion.

WHEN the paroxysm has subsided, we are to proceed with a further application of such remedies as may best counteract the remote causes. This part of the practice has been less attended to* than any other, though very ample experience has confirmed the fact that it is only by removing the predisposition, that the disease can be cured.

It is therefore our duty to urge the necessity of removing or counteracting all the exciting causes, and to shew in what condition of the body they may produce their effects. This is the most important object in the treatment of Asthma, and unless the confidence and submission of the patient correspond entirely with the solicitude and honest advice of his Physician, he cannot be insured against the future attacks of the disease, though a paroxysm may have terminated in the most perfect intermission; nor can any blame be reasonably attached to his adviser, if the disorder return.

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* See Tonics in Sect. XV.

The reader may in some measure, anticipate the plan of cure, if he have attended to the observations on the *predisposition* and *exciting* causes of the first species, which takes in so large a majority of cases. He is referred to Sect. X, XI, XII, XIII, where the *nocentia* are pointed out, and consequently the means of avoiding their effects. The remedies mentioned in the 15th section may further assist his views, if he particularly notice the observations on stomachics, and tonics.

I shall here offer some further remarks on the Symptoms as they appear successively in Convulsive Asthma, and then more particularly attend to the distinction and to the treatment of each of the Four Species in their proper order.

Of the Symptoms which are said to constitute Spasmodic Asthma, the most essential one is the *difficulty of breathing;* by which in definite terms we are to understand the convulsive re-action of the respiratory muscles. This belongs to all the species; and it is more in compliance with established method than the natural fact, that the other symptoms have been considered as diagnostic.

In consequence of this view of the subject, the difinition in this inquiry was framed in terms which may possibly be objected to:* but in confirmation of it, I have observed the symptoms to appear individually in succession, at greater or less intervals; and the violent re-action of the muscles to crown the whole in the following order:—First, the *Wheezing* was perceived: after an interval of many months, *Anxiety* and *Straitness* of the præcordia succeeded: then the short and interrupted *Cough* came by fits in the morning or after meals. *Dyspnœa* then appeared, and gave, in some cases, a more certain prognostic of Periodic Asthma; but often the *Convulsions* made a sudden attack without this intervening state.

The other symptoms may therefore appear, collectedly or individually, without the convulsive re-action; but unless this be added to them, a paroxysm of Asthma cannot exist. They denote a pre-disposing state of the Thoracic or Abdominal Viscera, which the re-action is intended to remove.

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* See Sect. I.

This progress may be seen most distinctly in subjects, who, from being less irritable than others, are not so soon seized with a paroxysm. But there must be better opportunities for this observation than are usually allowed to the Physician, who is seldom called for till the attack has taken place. Still, by examining into the previous complaints of the patient, with some actual observation of the present disorder, he may obtain his object of inquiry.

The following cases exemplify this gradation of symptoms.

CASE.

Mr. T———N is about fifty years of age.—Two years ago, when he was in bed, he first perceived a Wheezing in his respiration, which has returned almost every night since without any difficulty of breathing. It was like blowing through a reed, and gradually became worse. Last winter he had a Cough and Spitting for the first time, and some straitness under the sternum, but no fit of the Asthma. In the day he was free from wheezing, and had no dyspnœa.

When I first saw him, I found that he was subject to indigestion and head-ache, which generally came after meals. His pulse was regular, but pressure on the pit of the stomach gave him uneasiness. His urine was high-coloured, and his feces were pale. I considered him as predisposed to Asthma by a turgid state of the liver, and weakness of the stomach. These organs would press the diaphragm when the patient lay down, and the trachea would be narrowed.

I prescribed the following mercurial pill and saline draughts:

℞ Pilulæ Hydrargyri gr. v.
Fiat pilula omni nocte deglutienda.

℞ Potassæ subcarbonat. ℈j.
Succi Limon. q. s.
Tincturæ Rhabarbari
———— Columbo āā ʒi.
Magnesiæ gr. v.
Aquæ puræ ʒx.
M. Fiat haustus ter quotidie repetendus.

These medicines took off the uneasiness at the stomach, and lessened the Wheezing, but did not cure it. He had still symptoms of indigestion; and I prescribed Rubigo Ferri and Ginger, with the hope of preventing a paroxysm of Asthma in the ensuing winter.

The tonics did not succeed well, given in this manner, for the bowels were too much confined. I then directed the following:

℞ Sodæ Subcarbon. gr. x.
Pulv. Rhabarbari gr. v.
Aquæ Pimentæ ℥iss.
M. ft. Haustus vespere sumendus quotidie.

He took this draught every night for a month.— A draught of bitter infusion with three grains of rhubarb was also taken every morning, and at mid-day, for several weeks. Under this course the symptoms were removed, and the Asthmatic paroxysm did not come on.

The Wheezing had made him call his complaint an Asthma, from his observation of that disease in others; but if he had been seized with the fit, he would have felt a painful distinction.

CASE.

Hr. H, of Hamburgh, had been affected with wheezing for three years, and a straitness at the præcordia, with occasional coughs for one year, before he was seized with a fit of the Convulsive Asthma. He had general good health till he was upwards of forty years old; and the wheezing came on in consequence of travelling in wet cloathes in Westphalia. It was always confined to the night, and grew worse after some hours of rest. In the winter of 1798, he had a paroxysm for the first time. The astonishment he expressed at the seizure, sufficiently shewed, that he had been previously unacquainted with this violent re-action of the muscles. It occurred after he had long made use of antimonial diaphoretics, and tepid bathing, which were advised by a German Physician, probably, in consideration of the remote cause of his complaint.

He had my advice in the spring 1799, when he had experienced three paroxysms. He was recommended to take iron rust, and bitter infusion, twice every morning: to use warm cloathing, and the flesh-brush; a continuance of the tepid bath every other day, but with the caution of lowering the temperature gradually, till it was reduced to sixty degrees of Fahrenheit, at which he was to continue its use. He was enjoined to keep his stomach free from indigestion, and to use regular exercise. His progress was favourable from the time this plan was commenced: he had no paroxysm in the summer-months of 1799, but he had a slight one in November of the same year, after exposure to great cold. His complaints were, after that, confined to wheezing, and an occasional cough, with expectoration. He still pursued his plan; and these remains of disease were entirely overcome in January 1800.

The first of these cases only offers negative evidence; but it is so strengthened by the last, that the mind is as well convinced of the tendency to Asthma in the one, as of the actual existence of this disease in the other.

If it be said then, that the increased exertions of the muscles are *motus medicati* to remove a disease, and not the disease itself, it may be answered, that nature employs the re-actions for her safety and if the injury previously felt were not Asthma; yet that the re-actions having become morbid by excess, are really that disease. The convulsive actions in ileus, may be *motus medicati;* but they counteract their purpose by their violence. The re-actions of Asthma are so far morbid, as to exist by habit, after the cause has been removed, as in the Fourth Species. And they are so essential to the character of Asthma, as it is described by pathologists, that if all the other symptoms existed, these would not be acknowledged as Asthma, whilst the re-actions were absent.

THE FIRST SPECIES.

It has been stated, that a precise distinction between the *First** and the *Third*† *Species*, cannot be convincingly proved in all cases, but I do not consider this difficulty to be of great importance.

Where dyspepsia alone occasions the re-action of the respiratory muscles, it may be said, that the Third Species of Asthma is formed before the patient had been reduced to the state of habit which more certainly causes the First; and this reasoning is conformable to the laws which regulate all the actions of the muscles of respiration.

The First Species may therefore include two causes, each equal to the visible effect; but as the proportions of irritability vary in different subjects, muscular re-action is sooner excited in one than in the other.

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* See Sect. IV. VII. IX.

† See Sect. XIII.

We may be guided frequently to a distinction by the consideration, that, in the Third Species, the subject is more likely to be young, and to have a greater degree of bodily vigour than is usually possessed by an Asthmatic suffering under the First Species.

He is probably attacked after dinner, or a meal of indigestible food, or after drinking flatulent liquor; but the subject of the First Species is generally seized in the night, after having slept.

Mucus is discharged in both species, by coughing. In the Third, this excretion may be remotely owing to an obstruction in some of the Abdominal Viscera, or to the distention of the first passages, from dyspepsia, since, if either of these states exist, there will probably be a difficult transmission of blood through the lungs; and lymph may be forced out of the vessels, occasioning expectoration, as well as diabetic urine.*

But here the mucus may be expected to be less in quantity, and it must be considered as an effect of the condition that causes the re-action, and not the cause itself, as in the First Species.

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* See Sect. X. p. 146.—Sect. XIII.

TREATMENT of the *First Species.*

In the treatment of the First Species, it is now obvious, that the proper indications can be only answered effectually by the use of medicines, which give a contractile tone to the pulmonary capillaries, augment the power of the stomach and bowels, and promote absorption and strength through the whole habit.

For these purposes, iron, bitters, and the mineral acids are to be first recommended, as most generally useful and essentially proper. If these agents be applied and diversified according to their effects, they will frequently prevent the recurrence of paroxysms, by altering that condition of the body in which they were excited.

The Peruvian bark is only in particular instances to be ranked with the best means of cure in this disease. But the absorbent earths united with bitters are very generally necessary, and when combined with other agents produce the best effects in many cases.

Cold bathing, daily exercise, and frequent changes of air are equally important, and may be considered as essential aids in the general intention of conquering Asthma.

We must begin to use absorbents at the close of the paroxysm, employing magnesia when the body is costive, but preferring chalk in common instances. But though magnesia or chalk, given in bitter infusions, will afford temporary relief in cases of dyspepsia, they must not be relied upon for a more extensive advantage.

The preparations of iron are to be given at first in small doses, and afterwards in larger. If heat or pain occasionally attend, we must, during these symptoms, suspend their use, and substitute saline draughts with opium.

When the paroxysm threatens to appear, the exhibition of these tonics must be again suspended, and the plan should be pursued which has been pointed out in the last section.

In this manner every preparation of iron may be used in the intervals of the paroxysms, but the rubigo ferri or carbonas ferri is much to be preferred in general cases. The directions which are given by LEWIS and CULLEN, and other writers on the materia medica, are well known, and should be generally observed in prescribing this mineral.

A patient perseverance in this plan of treatment has been answered by the best effect in numerous instances. The following cases will exemplify the directions, and at the same time shew the success that has attended them. I shall class the following Cases according to the arrangement of species which has been proposed, but the reader may alter this order, according to his views of the pathology of Asthma, which cannot render these practical directions less useful.

CASE I.

A clergyman, forty-eight years old, had been subject, since his thirtieth year, to this species of Asthma. I had seen him in two paroxysms; and, after the last, I succeeded in engaging his attention to a course of medicine to prevent a return.

A powder of crab's claws, rhubarb, and pulv. aromat. was directed to be taken every day after dinner, and to be repeated occasionally, if the disordered state of the stomach required it. I also prescribed pills of Sulphate of iron and extract of Gentian of which he took three twice a day, with an infusion of columbo root and ginger for several weeks, when the paroxysm returned, during the continuance of which they were suspended. At the close of the fit he resumed them; but after a few days they were changed for ten grains of Carbonate of Iron twice a day, and five grains of rhubarb were taken every night: the cold bath was also used every other day; his diet was more cordial, and he was indulged with porter. After a perseverance in this plan for some time, his medicines were occasionally suspended, and frequently changed into other forms of the same class. He afterwards bathed in the sea for several weeks. He was used to sustain twelve paroxysms in the year, but he is now free from them, and carries every mark of health, with a perfect freedom of digestion and breathing.

CASE II.

Mr. JONES, a young man of thirty, had been for some time affected with Convulsive Asthma. After the paroxysm, he had usually expectorated mucus mixed with blood. As he had no inflammatory disposition in his habit, I judged that the blood escaped from the pulmonary capillaries in consequence of their weakness, rather than from the force of the circulation. He wheezed, and there was dyspnœa during the day.

June 1798. I prescribed pills composed of Carbonas ferri and extractum cinchonæ, with the sulphuric acid to be taken in water after each dose of the pills. He was also directed to use the Cold Bath. During this course he slept in the country. The event entirely corresponded with my expectation, Having continued to pursue these means for many months, he was entirely free from disease.

CASE III.

William Millington, aged 50, March 11, 1799. He had been affected with Convulsive Asthma many years, particularly in the winter. He has been now very bad for six months with constant dyspnœa, accompanied with considerable sickness when he moves. Flatulence and sourness of the stomach are very distressing. He coughs at uncertain times, and wheezes. At night the fit seizes him in bed, and prevents his lying down; and goes off regularly about five in the morning. He expectorates with difficulty. He is lusty, and has been used to hard work. His urine is copious and pale; his pulse weak, but regular. He has had no clear intermission for several weeks.

I prescribed carbonate of iron and directed him to take a tea-spoonful of this powder three times a-day in any vehicle.

March 15. He has taken nearly two ounces of the rust of iron. His dyspnœa, flatulence, and acidity of the stomach are much less; his appetite is better, and his pulse stronger: he coughs a good deal more, but he spits with greater freedom; and his nights are so improved, that he expects to be very soon free from the fit. I ordered two ounces of rubigo ferri, to be repeated.

March 18. His stomach is much better than on the 13th. His cough is not so frequent, but he has a free expectoration. The mucus has a common appearance; but three weeks since it was dark-coloured. He now passes his nights in sleep, and has no difficulty of breathing. His pulse is 65, full and firm. He has no tightness at the præcordia. His belly is regular, and his feces are black. His urine is deeper coloured, and less in quantity. He has always been subject to nervous tremblings, which have increased upon him the two last days, particularly on rising in a morning. This seemed to be his only complaint: I, however, directed him to continue to take the rust of iron twice a-day; and I prescribed some tinct. of opium, with camphor mixture, to be taken at the same time.

April 17. No return of dyspnœa or Asthma. He has taken the powder and the mixture regularly. His tremor is much less, but not gone.

May 15. He has been taking rubigo ferri three times a-day for a month; a tea-spoonful at a dose. He has had no return of Asthma, and his nervous complaint seldom affects him. He is now perfectly well.

CASE IV.

June 26, 1799. Mr. T. aged 36, is an engraver, and has had Convulsive Asthma four or five years. The fits have been most severe in autumn, and in cold damp weather. Sourness, and flatulence of the stomach and bowels had been troublesome for some time. Coughing and Spitting in the night followed these symptoms; and, after a while, a Convulsive paroxysm attacked him in place of his cough.

He has now, in the day, a short cough and dyspnœa; and he has had regular fits of Asthma the fourteen last nights. His stomach disorder still predominates, and is always aggravated when the Asthma is worse.

℞ Pulv. Cretæ ppt. ʒii.
Vini Ipecacuhan. ℥ss.
Aquæ Menthæ piperit. ℥vss. m.
Capiat Cochl. largum ter in die.

June 30. Since the first day of his taking the medicine, his stomach has been free from disorder, and his nights have been passed without the fit. According to direction, he has entirely avoided malt liquor, garden-stuff, and tobacco. He had a nausea from the medicine, but did not puke; and the sensation accompanying it seemed to go downwards in his bowels, followed sometimes, but not always by a stool.

I now prescribed as follows;
℞ Carbonatis ferri ʒii.
Pulv. Rhei ʒss.
Ol. Menth. piperit. gtt. x.
Conservæ cynosbat. q. s. fiant pilulæ 40.
Capiat tres mane et meridie quotidie. Insuper bibat haustum aquæ puræ cum guttis quindecim sequentis:
℞ Elixir. Vitriol. Acid. ℥iss.

June 19, 1800. He has only had two mild fits in the winter from taking cold. He has been much better upon the whole, but has not quite lost his stomach complaint, which attacks him when he eats salt meats or bacon. He has returned to the use of vegetables, and he takes every day malt liquor in moderation.

The effect of treatment on the disease of this patient affords a very reasonable expectation that he may perfectly recover, if he will entirely abandon improper diet, and be less sedentary.

CASE V.

Mr. S. 38 years old. This gentleman retired from London to a residence in Hertfordshire, in consequence of the attacks of Convulsive Asthma, which had affected him several years. He attributes the disease to a cold taken after profuse perspiration in a public place: but he had been previously affected with habitual indigestion, and the first paroxysm came after a luxurious dinner, and a great deal of wine. He has regulated himself by advice, and taken the prescriptions of very eminent Physicians, without benefit. He is still attacked with Convulsive Asthma, and says, the country is only to be preferred to the town, as it gives him a better opportunity of being quiet, and free from the temptations of pleasure. On the other hand, he thinks himself too much affected with cold in the country. He has not taken medicine, except in the paroxysms, in which he took æther, opium, and pukes of Ipecacuhan. The paroxysm has returned every three weeks in the winter: in the summer months he has been more free from it. He spits at the termination of the fit, and sometimes has a diarrhœa. He wheezes in the fit; and has frequently, but not always, dyspnœa in the intervals. He has been cautioned to preserve a proper diet, but he often breaks his rules. He was very robust a few years since, but he has lost flesh, and weighs about eleven stone. His bowels are lax—his pulse regular. If he eats garden-stuff, or drinks malt liquor, he is certain of a purging, with dyspnœa, and expects the paroxysm.

May 10, 1798. I had the history of his complaints; and found, that in consequence of some imprudence, the first passages were, at this time, particularly weakened and disordered. I earnestly recommended a rigid attention to diet, and exercise on horseback. I prescribed two grains of rhubarb, with chalk and ginger, to be taken twice a-day, with an infusion of quassia wood.

June 20. He had had a paroxysm. His stomach was less disordered, but he had been purged by the medicines, which was an effect I did not wish for. I directed ten grains of carbonate of iron, with three grains of pulv. ipecac. composit. to be taken twice a-day, with infusion of quassia. After a time, he took the rust of iron alone. In December 1798, he had a moderate fit; but this was the only attack he had suffered since he took the rust of iron. In May, 1800, he was in good health, and capable of cold bathing.

REMARKS.

In several of the preceding Cases the state of the stomach appeared sufficiently morbid to excite Asthma, without the aid of any additional irritation. The re-actions, it is probable, were partly caused by the disorder of the first passages in the 3d, 4th, and 5th Cases. Of these the 4th Case presented most striking evidence of this cause in the effect of the chalk and ipecacuhan in removing the difficulty of breathing. Yet the irregularity of this patient's habits, forced upon him by engagements in business, made him often neglect the means of recovery, which still advanced notwithstanding all obstacles. I have however considered them as cases of the First Species, since whatever disorder existed in the Stomach, the state of the lungs appeared in these instances more formidable and productive of greater irritation.

In Case the 3d, the decisive and prompt efficacy of the rust of iron was very remarkable. The patient took it in large doses, and during the dyspnœa, which for some time was constant.

In Case the 2d, the rust of iron and the vitriolic acid were also very efficacious, and the patient ceased to expectorate blood during the application of these means.

THE SECOND SPECIES.

Of the *Second Species,*[*] it has been remarked, that an irritation in the trachea, naturally brings on an increased secretion of lymph to defend the membrane: but an observing practitioner can be at no loss to distinguish such an effect from the more copious spitting of the First Species, in which also, the habit of expectoration frequently appears between the paroxysms.

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[*] See Sect. XII.

The Second Species may be distinguished from the Third, by the capricious manner of the attack; from dyspepsia not having preceded, though it may occasionally attend the paroxysm; and from the fit going off without an apparently critical discharge. The uneasiness at the præcordia, called Anxiety, is in no greater degree than dyspepsia; and wheezing does not occur till the violence of muscular re-action is past.

In addition to these means of distinction, the result of a strict inquiry may also shew, that a particular place, or a certain point of the wind, produces a fit in this species; when, if a change of residence brings relief, the nature of the disease will be sufficiently manifest.

The Second may be distinguished from the Fourth Species by its form being preserved; whereas, the Fourth appears as a sequel, divested, more or less, of those original signs of material irritation, spitting, wheezing, and dyspepsia.

TREATMENT of the *Second Species.*

In the treatment of the *Second Species,* exhalation should be kept up from the vessels of the lungs by the use of diaphoretics. Small doses of opium are usefully conjoined, and the patient should be removed from the influence of irritating causes, such as are known to exist in towns and manufactories.

The Dry Asthma seldom occurs under the distinctions before marked out. It is not a disease which follows such dangerous debility as that of the first species, but it is more subtle and capricious in its attack, and less usefully influenced by the action of tonics, which may be frequently injurious by increasing the absorption from the pulmonary membrane, and consequently its dryness, and by this means laying it more open to offence from acrid particles in the air. It may be sometimes seen in the progress of convalescence from the first species, and it then shews that tonics have performed their part, and marks the propriety of suspending them.

CASE.

A gentleman had been many years subject to this species of Asthma, in which the fits usually terminated in some little expectoration, having begun to subside, when the tracheal passages became moist; at length he left a populous town on account of its frequent returns, and went into country lodgings only one mile distant. He was there free from his complaint, except the wind blew from the town, which brought on a paroxysm in two hours from the change, in six instances. When the wind blew again from the country, although easterly, the paroxysm soon went off.

At length he removed two miles further, and in this situation entirely lost his complaint, taking small doses of opium and absorbents, which prevented irritation from very slight offence, and corrected his digestion which was faulty: but the grand means of cure appeared to be a situation more remote from the origin of effluvia, which could not then arrive at his lungs, but in so diluted a state as to lose their influence.

In all cases of this kind there should be very particular inquiries made into the nature of the situation in which the patient lives. There may be many unsuspected causes for his sufferings; but, by retreating from some local inconvenience, these may altogether cease, and the occasion of their former existence be very manifest.

THE THIRD SPECIES.

In the observations which we have made on this species, one cause of the disease has been very particularly referred to the first passages. But besides the stomach and duodenum, some of the other viscera of the abdomen may be found to be diseased. We must not then conclude hastily, that an affection of the liver, of a kidney, of the uterus, or of the bladder, is a remote cause merely or an effect of Asthma; or that it is incurable. We are certain that the reaction of the respiratory muscles may be caused by an irritation in any one of those organs, and it may be necessary to examine closely for the purpose of discovering which of them is morbidly affected. We may be guided by the principles of this inquiry in the investigation, and without losing time in the application of expectorants and sedatives, we should proceed directly to remove the cause.

A disease of one of the organs of the lower viscera, may not be noticed so soon as a morbid affection of the stomach producing Asthma. Yet when it has been ascertained and the difficulty of breathing has been added to the former symptoms, the distinction between the two causes will be clear. The treatment must then be necessarily different, and employ deobstruents and diuretics, mercurials and gentle aperients. Iron and other tonics, must be cautiously avoided till the obstructed organ has been perfectly relieved.

On the contrary when dyspepsia appears divested of the causes of complaint in the lower viscera, there can be no practical inconvenience, since both the stomach and the lungs must be cured of their weakness before the Asthma can be removed. The object of suspending or shortening the paroxysm is of little importance, when compared with that of security against its return, which can only be attained by the same general means in either species.

TREATMENT of the *Third Species.*

The cure of the Third Species is to be attempted by the means generally proposed in the First, with the exception of cases of obstructed viscera. A more free use of absorbents, and a more rigid attention to diet are here necessary. These means will frequently surprise the Asthmatic by their excellent effects, when the irritation proceeds from disorder of the first passages only.

I have no doubt of the fact, that acrimony sometimes gradually, accumulates in the stomach and duodenum, until a paroxysm is excited without other causes of irritation; but more extensive observation, with reference to the principles here laid down, is necessary to settle clearly the distinction between the first and third species.

Affections of the Stomach, &c.

CASE I.

R. S. aged forty, of rather a full habit, but pale skin, applied to me. I found that he had suffered many attacks which had been clearly considered fits of convulsive Asthma by his friends and medical advisers. These were preceded by puking, flatulence, and acidity of the stomach, with other symptoms of dyspepsia. I directed the following draught to be taken three times a day, viz.

℞. Pulv. Cretæ ʒss.
Tinct. Opii gutt. xv.
Ætheris Vitriol. gutt. 40.
Infusi Flor. Chamæm. ℥iss.
Tinct. Calumbæ ʒii. m.

A few grains of rhubarb were also taken every night at bed-time. He had been affected with a diarrhœa, which sometimes preceded, and at other times followed, his paroxysm, without regularity. The disorder of the first passages was soon checked, and the returns of the paroxysm were delayed by the medicine. Afterwards a course of iron, with other tonics, was pursued with great success in confirming the habit, and finally curing the disease; as I have recently been informed that no paroxysm has occurred for several years.

I infer, that the cause of this disease must have existed in the first passages, and I think that the success which attended the treatment of this, and many similar cases that follow, can only be explained by referring to those principles of the animal economy regulating muscular contractions which were considered in Sect. xiii.

CASE II.

Mr. **Parish.** This patient is forty years of age. In 1792, he found himself weak and low, and was affected with Difficulty of Breathing. The dyspnœa increased; and at length he had a paroxysm of Convulsive Asthma that attacked him by night, generally an hour after he had lain down in bed. It was distinguished by a very particular stifling sensation in the throat, occasioned, as he believes, by the wind in his stomach.

His wheezing in the paroxysm might be heard all over the house; and this symptom troubled him in the day, if he had taken cold, which he became very liable to do. He had coughing fits, which seemed to come on when the flatulence was most distressing. He expectorated in the morning, but not considerably. Though his first complaint seemed to be in the stomach, he had no sickness, but great oppression, with very sour eructations. He had also very often a scorbutic eruption on his skin. He had been attended by an eminent Surgeon, and a Physician of great reputation. The disease was considered by them as an Asthma, and treated without success. At length he went into the country, apparently incurable, since his wife had been assured, that medicine would be of no use: and that, "if he lived a month, it "would be the outside." Soon afterwards I saw him, and had the history of his disorder. He had been ill six or seven years.

August 6, 1798, I prescribed the following:

℞. Carbonat. Ferri ℥i
Pulv. Zinzib.
—Rhei āā ʒi
Conserv. Cort. Aurant. ʒvi.
Syr. q. s. ft. Elect.
Capiat. q. n. m. bis in die.

Superbibat guttas xv. Elixir. Vitriol. acid. ex aquæ puræ cyatho.

After he had taken of this electuary with the acid elixir of vitriol for five or six months, he found himself perfectly free from his complaint, and remains so. His recovery was progressive from the first day. He all the while refrained from vegetables, and was sparing in malt liquor. The eruption was cured also.

Affection of the Liver and Bowels.

CASE III.

A YOUNG lady, aged 22, had had a stomach complaint for a considerable time. Suddenly she had a diarrhœa, in which the feces were nearly black. The first impression created a fainting fit; but, after one copious discharge, she was greatly revived. In two hours after she had convulsive respiration, which was relieved by more stools. Two months afterwards she had a true paroxysm of Asthma, which came on after dinner. I saw her in this state, and was then made acquainted with the previous circumstances. She had had warning at the same hour in two preceding days, by pains of the stomach, which were disregarded, as her spirits and health were apparently good. Her bowels were costive; she had not been troubled with cough, or any dyspnœa; and had never wheezed. She had now the external re-actions in a violent manner, but only complained of stricture at the stomach.

I directed an enema, with purging salts; after which she had a puke, but she discharged only the dinner she had eaten. I then directed a dose of opium, with æther; but the symptoms continued with violence. A consideration of the time of the attack, and her previous complaints, then induced me to think that all means would be superfluous before the first passages were emptied. I therefore directed a bolus of calomel and rhubarb; and a camphor mixture with kali tartarizat. and magnesia. The enema was repeated in two hours after the bolus. In three hours she began to have motions, highly fetid, and dark coloured: every motion relieved her breathing, and by night the paroxysm was finished.

My views in this case were assisted by a recollection of Dr. PERCIVAL'S remarks on the Atrabilis, in which he introduces some similar instances, with a suggestion, that the bile might be a cause of the Convulsive Asthma, rather than an effect.*

There seems to be no reason for dissenting from his opinion, which is sufficiently defended, *a priori*, by the laws of muscular re-action, however little they may have been noticed by pathologists, or consulted in the general practice.

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* Percival's Essays, Vol. II. p. 112.

Affections of the Liver and First Passages.

CASE IV.

Mrs. D. is about 30 years of age, of a brown complexion, and a thin irritable habit, with a disposition to accumulations of bile, followed by sickness or diarrhœa, or both. She had a Catarrhal Cough in the winter, without a paroxysm. This was nearly gone, when she was seized to her surprize with an acute fit of Asthma, after eating pastry, and other improper things, which from the state of her stomach, had been forbidden. She had complained of a pain at the sternum, and below the ensiform cartilage. Her bowels had been very irregular; her eyes were yellow, and her urine high-coloured: and, at the time of my visit, she had been costive two days.

March 30, she had great dyspnœa in the day. The preceding night she had had no sleep, and it was the second paroxysm that she had suffered. I prescribed, with the intention of bringing on nausea, or purging, which had, before her present attack, been natural means of relief,

R. Pulv. Scillæ siccatæ.
—— Ipecacuhanæ āā ℈i.
Calomel. ppt. gr. v
Saponis albi. ʒss.
Mucilag. q. s. fiant Pilulæ 20.
Capiat duas ter in die.

These Pills provoked a nausea only. I therefore ordered Ol. Ricini, to open the bowels more completely. Believing there was congestion in the liver, I thought it useless to give antispasmodics till it was removed, and the discharges were free. In two days she was greatly relieved of uneasiness at the stomach, having had stools freely.

April 5. I found she had had a most violent and distressing fit the evening before, which had continued all the night, and caused great alarm to herself and friends. I questioned her narrowly, and found that her stools had been clayey the preceding day, and that she had had great oppression at the stomach after dinner, having imprudently eaten of fat roast beef.

I prescribed an emetic with a pill of calomel to be taken when the emetic had operated, and a saline draught every four hours afterwards. The next day she had high-coloured bilious stools, with relief. Her cough, which previously to the Asthma had been very vexing, now gave her little trouble, which evinced that the cause of this disease was not in her lungs. She, however, wheezed in the fits; and her pulse became quick every evening. Every day I promoted a discharge from the bowels; and after three days she lost the paroxysm under means which would have prolonged it, if it had belonged to the First Species. Opiates did not suit her; and bitter infusions seemed ineffectual, without free discharges. She was directed to take daily for a considerable time pills of Pilul. aloes cum myrrha, with ammoniac and soap.

I did not, however, expect, that she would continue to be free from Convulsive Asthma, because she had been long subject to biliary obstructions, and was of an irritable habit, with causes of continual uneasiness, that disordered her stomach, and the secretions of the liver.

This lady has however continued free from the disease, by punctual attention to the state of her bowels.

CASE V.

Mr. J. aged 40, had been affected with constipated bowels and deficient flow of bile more or less, for five years; and, unfortunately, as this state became more habitual, he more neglected it. At length he had a paroxysm of Convulsive Asthma, accompanied with a bilious countenance, and some tenderness at the pit of the stomach. He had also previously experienced pains shooting from that part to his back. He had had many fits in the preceding eighteen months before he applied to me, in the spring of 1799. Tinct. opii. relieved them, but they did not go off till he had had stools, and they soon returned. I found he had lived luxuriously without sufficient exercise.

I prescribed pills of aloes, soap, and pilula scillæ every night, and I recommended Cheltenham water after the use of these pills for three weeks. He complied with this plan, and soon had relief from the dyspnœa that had affected him in the remissions. On his road from Ireland to Cheltenham he had a severe paroxysm; but he staid at Cheltenham six weeks drinking the water, and had none. He had also been free from any return two years after this period, when I was informed that he had taken a great deal of exercise and was in vigorous health.

REMARKS.

It appears from several of these cases, that Convulsive Asthma may very probably be caused by collections of viscid sordes in the duodenum and stomach. In such instances wheezing and other symptoms may naturally follow the dyspeptic condition of the stomach, of which flatulence is a principal symptom. The difficult respiration, an effect of the whole, may unite with this state in consequence of the languid passage of the blood through the lungs, and the spasmodic action of the external muscles.

Dyspeptic disorders are much connected with affections of the liver, and particularly with those in which the discharges of bile into the duodenum, are uncertain, and deficient, as in CASE V.

In these cases the bowels must be subject to costiveness, and their want of action, will affect the stomach with languor, and occasion the delay of its contents till they ferment and become irritating by their acrimony.

On the contrary, when the bile flows copiously from too irritable a state of the secreting vessels, its properties may be such as to cause Asthmatic fits in its passage through the bowels; and this effect of its irritating properties may take place with violence, if it has been obstructed in its passage from the liver for an unusual length of time, as in CASE III. and IV.

Affections of the Uterus.

CASE VI.

Mrs. T. aged 49, had been several years subject to Dyspnœa in the winter. Since the menses ceased to appear two years ago, she has been considerably worse in this respect. Paroxysms of Convulsive Asthma have been frequent, and violent, preventing her lying down in the night. She wheezes, her bowels are costive, and she has frequently the piles. She expectorates in a morning, but not freely.

March 19, 1799. I directed an expectorant mixture of ammoniac and acetum scillæ, but it seemed to increase the disposition to cough, without promoting spitting.

March 27, I prescribed gentle aperients with asafetida, camphor and opium, but with no success in moderating the paroxysm.

April 5, after having considered her habit and period of life, I applied to saline medicines, with tinct. opii. and bleeding. These means were most useful, but she still suffered returns of the paroxysm, though more distant, and comparatively mild.

1806. Mrs. T. had been without dyspnœa for four years, but during this period she had sustained several fits of Asthma. In the last two years she had only one paroxysm from a violent cold in the winter of 1804. The plan that was recommended to her had been diligently followed. When the bowels had become regular by the use of saline aperients, the Asthmatic fit was more forcible, but the dyspnœa did not distress her in the intervals. She then took tonics, and supported the stomach with bitters and rhubarb. Saline aperients were still interposed, but bleeding was left off. She considered herself well in 1806.

CASE VII.

Mrs. P. aged 52, a delicate woman, but previously to her present complaint strong and muscular, had been affected with an Asthma for some time past. The menses became sparing when she was 45 years old: and after they had ceased for eight months, they returned, and have been profuse about once in three months, for the last two years. In every instance the discharge was preceded by a paroxysm of Asthma. Between the fits she is disposed to hysterical symptoms, and has great pains in the back and loins. Her pulse is full and strong before the paroxysm, which she knows when to expect, as it has lately attacked her every six weeks with considerable regularity.

I advised a quiet life, saline medicines, with tinct. opii. and venesection once in two months. Soon after she stood in the shower-bath every other day. The plan was manifestly useful, and in six months the menses ceased to appear, though she had a slight paroxysm in that time; but nine months have elapsed since without one, and she has a shew of menses, at long intervals, without inconvenience.

REMARKS.

The cases of these two females appeared to be manifestly influenced by their respective periods of life.

The Convulsive Asthma of Mrs. P. seemed to be entirely caused by the state of the uterus, as a discharge from the uterine vessels terminated every paroxysm: and she had not experienced Asthma till the change of life had commenced. She had no cough, wheezing, or straitness, but she had always experienced great pains in the loins and neighbouring parts preceding the paroxysm. The turgescence appeared to affect the uterus only, and the lungs were not distressed.

The treatment was agreeable to well known rules applied to her circumstances unconnected with Asthma, but the Asthma disappeared as her constitution settled.

Cases of this kind very commonly occur. They admit of occasional variation of treatment, but expectorants cannot be useful in any intention of cure, although the general practice proposes little more for the patient's relief.

Affections of the Urinary Organs.

CASE VIII.

Mr. M——— had been a free liver, and particularly attached to women. He suffered severely in consequence; and before he was

35 years old, had been much used to bougies. A few years afterwards he had such an irritation in his bladder, as occasioned the suspicion of a stone, but none was found by sounding. Discharges of purulent mucus appeared in his urine, and he was troubled with tenesmus. At 44 years of age, it was determined that the prostate gland was diseased; but it was still uncertain if there was a stone in the bladder. He now began to cough more than usual, and to be affected with diarrhœa at times. He had no expectoration, and little or no increase of quickness of pulse. This was nearly his general state, when, after much irritation in his bowels with liquid stools, a fit of the Convulsive Asthma seized him, which lasted two or three days with morning remissions.

In February, 1798, he was well acquainted with these attacks, and assured me, by letter, that they had always been preceded by particular irritation in the lower bowels and bladder. Sometimes blood appeared in the urine, but generally there was purulent matter, mixed with dark-coloured particles, but no concretions of gravel. His urine was of a bad smell.

I saw him in May, 1798, for the first time; and have seen him frequently since. His paroxysms are purely convulsions of the external muscles, unattended by straitness, anxiety, or wheezing; a cough often, but not always occurs; and he spits very little at the termination of the fit. I was so satisfied as to the cause of this disease, that I made no attempt to cure the Asthma but by moderating the irritation in the bladder. I prescribed uva ursi, and pills of opium; and starch glysters, with tinct. opii. These means have greatly abated the Convulsive Asthma, but not cured it.

CASE IX.

Mr. R. is 32 years of age, and has had calculous complaints as long as he can remember. When he was 16 years old, a stone was taken from his bladder. This stone appears to have adhered to a concretion that could not be extracted, and nephritic symptoms have been habitual to him ever since. He was seized with a paroxysm of Convulsive Asthma thirteen years ago, and it has returned very frequently since. He has attended particularly, from my suggestion, to the connexion of Asthma with the fit of the stone; and says, he believes the latter, constantly brought on the former, or accompanied it: and this, he thinks, must have long been the case, though the irritation of the stone being more habitual his observation had formerly been less accurate. He is certain of a particular fact of long standing:---his water was always deep red, or coffee-coloured preceding a paroxysm.

This young man possessed unsubdued vivacity and courage; and great activity in the business of wire-drawing for many years. His diseases are now tending to phthisis. He has had spittings of blood in the last year, and expectorates pus at intervals, which give relief for a time. Digitalis, and opium have been useful. The calculous complaints still keep him in a constant torment, notwithstanding the frequent use of opium and soda. Since the hæmoptoe and hectic began, he has had no distinctly periodic fits of Asthma, but his habit seems generally diseased.

The obstructed state of the urinary passages, and of the vessels connected with them, probably induced the pulmonary disease; but the muscular re-actions took place ten years before this complication.*

REMARKS.

From the two preceding cases and many similar forms of Convulsive Asthma, it appears probable, that the re-action is frequently occasioned by diseases of the kidneys and urinary passages.

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* This patient died since the first publication of his case.

A patient now under my care had long felt symptoms of piles, and ischuria, which were accompanied or followed by fits of Asthma. Soda water mitigated his complaint, and lately he has passed bloody urine with immediate suspension of his Asthma.

I have seen several Asthmatics who were much harassed with nephritic complaints; and stones have been found in the bladder or kidneys of others. These cases seemed only to admit of occasional relief. Mr. R. had used alcaline aerated water for a considerable length of time; and afterwards soda with opium.

The case of Mr. M. is not less hopeless in any intention of cure; but I have seen opiates give him relief; and these are the only means he now applies to.

THE FOURTH SPECIES.

The *Fourth Species*[*] may be considered as established, when general strength of body is acquired, with good digestion; when expectoration is much diminished, and particularly when dyspnœa and wheezing are gone, the disease retaining only its original symptom of convulsive respiration: it generally succeeds the First and Third Species after a diligent employment of the means of cure, but in appearance, it is more allied to the Second than to any other, though an attention to the previous state of the patient will point out the distinction between the two species.

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[*] See Sect. XIV.

To be more assured of the nature of the disease in these circumstances, the effect of sedatives should be tried; and if the paroxysm be suspended by a dose of opium, or æther, the patient may be allowed to expect, that by a steady perseverance in the directions that had brought him to this state, a cure may be confirmed.

TREATMENT of the *Fourth Species*.

In the treatment of the Fourth Species, the principles we have delivered must be well considered. When the effect of antispasmodics and the progress of convalescence have established the distinction of this species, remedies may be prescribed with sufficient certainty. The influence of external impressions must not be neglected. After tonics had removed the weakness of an Asthmatic, a change of ideas, aided by the use of opium to abate sensibility of slight irritations, would have secured him from relapse, if the exertion had been recommended, or its necessity foreseen. A neglect of these means may be considered in many instances as causing the return of Convulsions of the muscles of respiration. This truth might be supported by the evidence of several cases within my knowledge, but I shall give the following as an example particularly under my observation.

CASE.

R. B. enjoyed general health in various situations till the year 1783, when symptoms of indigestion first attacked him at twenty-five years of age. The disorder increased gradually for four years. He was hypochondriac, sleepy after meals, and had constant pains in the intercostal muscles.

1788. His eyes were constantly inflamed, and a stupor came on every night, which made reading very painful. He had lived much upon a weak and fluid diet, and had taken saline medicines injudiciously.

In the summer of this year, after awaking in the morning, he perceived some wheezing in his expirations, but no dyspnœa, In the autumn, after a catarrh, and fatigue in riding, he was seized in the usual manner, with a paroxysm of the Convulsive Asthma of the first species.

In the succeeding winter he had several paroxysms, and tried the means of alleviating them, which are pointed out in the preceding sections. His experiments frequently prolonged the fits, and the intermissions were neglected.

This disease preserved its character for four years after its first attack, and was remarkably excited by the following remote cause:---In Warwickshire there is the highest level in the kingdom, from which rivulets descend to the eastern and western oceans. The soil is gravelly, but always moist with springs; the air is light, and the constant evaporation from the earth makes it cold. He was frequently called to this neighbourhood from a residence at forty miles distance, and two hundred feet nearer to the level of the sea. In his first visit, after he had suffered the Asthma, he was seized with a very severe paroxysm on the evening of his arrival. He was laid up during his stay, and the symptoms had not subsided when he pursued his road back. As he descended from the high country, the dyspnœa gradually went off, notwithstanding the great fatigue he underwent. In the course of the four following years he repeated this journey, in warm and cold weather, and under various circumstances, seven times, but with the same result in every attempt.

1792. He had tried numerous remedies in the paroxysm, and had gained some advantage over it.* Dyspepsia was less, and his general health improved, but he had not yet succeeded in lengthening the intervals.

He now pursued more vigorously, the plan which he had adopted. He took iron in large doses, and in all preparations, but preferred the rust, which seemed to correct indigestion more effectually than any other. He went into the cold bath every other morning, and took absorbents occasionally with bitter infusions, and rhubarb.

In the summer dyspepsia had greatly abated, and the intermissions became longer. In October he went to Bath, and drank the water a few weeks with great benefit. He soon after resumed his tonics, and trusted chiefly to the rust of iron, taking chalk very seldom. The cold bath was suspended in the winter.

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* See the two preceding Sections.

1793. Some boils had appeared in the last year, and they now shewed themselves more frequently upon his face and body. The paroxysm did not come on so often, but it was excited by cold, and by the anxiety and fatigue of business. After considering his prospect and the obstacles which his state of health constantly opposed to his duty, he determined to abandon his profession rather than his hopes of a perfect cure.

1794.---In the winter he was very free from disordered respiration, which he attributed to excursions and change of ideas, in new pursuits, as well as to his previous use of medicine. In the spring he had two severe returns, excited once by the dust of oats, and a second time by that of hair powder, but he expectorated little, although the dyspnœa subsided with the paroxysm. His disease now seemed to approach the character of the second species, and the change was considered favourable. He also applied the principles of Sect. XIV. to these attacks, and determined to oppose them in future by sedatives, which he had long discarded as useless in this intention.

An opportunity occurred twenty days afterwards, when he completely stopped the paroxysm at its commencement, by two grains of opium dissolved in vinegar with æther. He enjoyed a good night, and arose in the morning without dyspnœa or expectoration.

He was now induced to see the event of a journey into Warwickshire, but here the paroxysm came as usual on the evening of his arrival, when his mind was occupied in reflecting on the distress that he had before experienced in the same place, and which he had great anxiety to escape. When he perceived the symptoms, he withdrew from company, and took a draught of cold water and vinegar, with forty drops of tinct. opii. He soon obtained relief, but it was not extended to a perfect removal of the affection, which he attributed to the strength of habit.

The dose of opium was repeated, and he had a good night, but no sleep: in the morning some dyspnœa remained, but not attended with wheezing. Further reflection strengthened his opinion that he was now under the dominion of a secondary disease established by habit, and he determined to oppose it by any effort which circumstances might demand. He recollected the aphorism of Hippocrates on the convulsive disease of epilepsy, and the doctrines of some modern writers on the powerful influence of custom or habit in the animal œconomy.

Military business appeared to be most opposite to his former pursuits, and therefore most likely to break the association of his ideas, to dissever the links by which they revived old sensations, or to conquer their influence. Exercise near the sea, where the density of the air might co-operate with the other means of cure, and the opportunity of amusing his curiosity by turning his mind to a new science, were his motives for taking a company in a regiment of militia, commanded by officers, who were his particular friends.

At the end of June 1794, he joined this regiment, then encamped upon a dry common, sloping towards the sea, which was at a few miles distance. In this situation he at first avoided, with great care, errors in diet, which are exciting causes frequently met with at military tables. But after a few weeks he found that an accidental deviation from rules was not followed by any inconvenience, and that precise caution was not necessary. He soon gave his whole attention to the scene before him, and attempted to fill his mind with the images which it presented. A new system of tactics being ordered to be practised by the regiments in camp, he employed himself in the study of its principles, and of their application to active service.

In these pursuits during the summer, and until late in the autumn, he had uninterrupted health. He again felt the vigorous spring of youth, and enjoyed a satisfaction of mind of which the capricious tyranny of his disorder had deprived him the preceding ten years. He generally arose at four in the morning, and often marched six miles in a cloud of dust with two brigades of infantry, to be reviewed in the heat of the day. Upon these occasions it was noon before he returned to the camp, but he neither experienced cough nor dyspnœa. Dyspepsia seemed to be entirely overcome: liberties were taken with every species of diet, and his exertions, however great, were never attended with fatigue. Towards the close of the campaign the season was very inclement, and the tents were wet with rain for several weeks, but he suffered no alteration for the worse in consequence of this circumstance, though he constantly slept in the camp.

1795.—He passed the winter in Cambridgeshire, and he had no return of Asthma.

In March he continued free from disorder, and considered himself so confirmed in health, as to determine upon finishing his military engagement.

About this time, having taken cold, and drunk bad wine, he had symptoms of his disease; but these symptoms were suspended by opium, and entirely carried off in a bilious diarrhœa.

At the end of March, fully satisfied with the success of an uncommon experiment, in which he had employed ten months, he resumed his regular profession, and from that period to the present time, he has felt no symptom of his former complaint.

He has therefore long considered himself cured of Asthma, as the interval of many years has elapsed since he had a paroxysm; but this conclusion is strengthened by other considerations. He is no longer troubled with indigestion, nor affected by the numerous exciting causes which prevail in towns of great population, where the air is much rarified, and impurities are continually floating in the atmosphere. To secure himself more effectually against a return, he however, pursued the means of prevention in cold bathing, and the use of tonics at intervals for several years after the last attack, and these cautions have completely confirmed his habit against the influence of causes which might otherwise have occasioned a relapse.

It appears from the preceding cases, and the effect of the practice, that Medical treatment in Asthma should be applied to the predisposition, and that unless this be radically removed the disorder will return. The successful agents are tonics applied with long and patient perseverance in the majority of cases. To these must be added such others as lessen morbid irritability, which seems to attend all forms of Asthma. In the Third Species the complaint frequently originates in the obstruction of some organ below the diaphragm, and in these instances an appropriate treatment for the cure of the diseased organ must supersede all employment of tonics. In the Fourth Species the means of changing the ideas, and conquering the influence of the mind on the sensations of the body, must accompany a diligent application of strengthening remedies.

Thus the Inquiry has shewn some specific Causes of Convulsive Asthma not before sufficiently attended to. If these really afford indications of Asthma, it may be expected that the practice will correspond with them. According to my experience, the directions which are here given will furnish the best means of alleviating the paroxysm and of curing the disease.

There are, however, contra-indications, and new symptoms in all diseases, which demand, occasionally, clinical attention; and in this disease, as well as others, no written rules will then supply the want of medical observation and experience. The general lines which are here laid down may, it is hoped, guide the student in his further inquiry, and probably assist the judgment of those who have not determined to limit their views to the distinction of Humoral and Convulsive Asthma.

GENERAL REMARKS.

It seems to be allowed that former rules of practice have failed in producing a cure of Convulsive Asthma, and that the attacks of this disease cannot be prevented by the use of squills, gum ammoniac, emulsions, bleeding, opium, or æther.

A question arises if nothing further is to be attempted by Physicians, or whether every instance of successful treatment ought not to be the object of study, and even excite inquiry into the means of cure or relief. If an advantage be gained over any intricate and obstinate malady, it becomes the duty of Physicians to endeavour to bring the fact within the circle of their principles, or to supply themselves with new ones. Until facts become connected with reasoning, and experience, no inferences can be drawn from them to extend with certainty the useful agency of medicine.

The want of success in treating Asthma may be partly attributed to the neglect of the intermissions. If Physicians have taken too limited a view of the pathology, patients have also too often confined their exertions to the treatment of the paroxysm of Asthma.

But in the treatment of the paroxysm medicine has been often misapplied, from the distinction of causes not having been properly attended to. An Antispasmodic can do little good when the first passages are loaded with irritating matter, or the lungs obstructed with viscid lymph.

If a patient be seized with a paroxysm after having eaten improper articles, as vegetables, salted meat, bacon, pastry, soups, or roasted goose, I should think the muscular re-actions might be attributed to these irritating materials, as I have seen the fit, in some instances, at its height before they could have been removed from the stomach; and in many more when they had not passed the bowels. Great inflation and acidity soon added to the irritations.

If the influence of such causes had been well understood, a dose of opium would not have been prescribed before the acrimony had been discharged, though after its removal this antispasmodic might have been useful.

It may be supposed that a case of this kind would be readily distinguished, but the fact is otherwise. The violence of the Asthmatic affection seems to arrest the whole attention of observers, when a simple evacuation of the stomach is sometimes the only effect required to remove it.

This was the case of Mr. I. S. who had suffered Asthma for a long time and been treated in the usual way. With great vivacity and intelligence, he is fond of society, and in his enjoyment of company he forgets his rules.

Preparations of iron were eminently serviceable to him, but not so strikingly useful as rhubarb and magnesia, which were afterwards taken every night by the advice of a judicious apothecary. The fit was prevented by this method, and it is even probable that no other means would be necessary to confirm a cure, if he would be more guarded in his diet.

Dr. SAUNDERS has remarked in his Treatise on the Liver, that " Many complaints which the patient is ready to refer to the organs of respiration, " or to the stomach, or other parts of the alimentary canal, may have their source in a morbid " state of this organ."

The opinion of this ingenious Physician is supported by strong facts, and the Third Species (Sect. 13.) of Asthma is partly founded upon the observation of such facts. But besides the cases that have been given under the Treatment of the Third Species (See Page 331—333) many more might be added, equally decisive.

A gentleman of very cultivated mind and a proportionate delicacy of frame, had for many years suffered Asthmatic fits, attended by the most extraordinary secretions of bile. The bile appeared to accumulate in ten or fourteen days; and in proportion as the sense of weight in the liver increased, a more oppressive feeling from food in the stomach took place also. At length both puking and purging became necessary, and afforded a more critical relief from the Convulsive fit of Asthma than any other operation. The discharge from the stomach generally discovered indigested matters, and that from the bowels unmixed bile in enormous quantity. Every method of alleviating his distress had been tried, in consultation with a physician of the greatest eminence, yet this discharge from the first passages was always a necessary part of the direction, and a means of suspending the paroxysm.

This must appear very distinctly to be a case of the Third Species. Very little expectoration attended the close of the paroxysm, and no cough during the intervals. No marks of pneumonic congestion or inflammation appeared, but the affection seemed to be confined to the liver and the disgestive organs; and this was most clearly felt and believed by the patient in opposition to the reasoning of some medical advisers, whose judgment being directed by the opinions of the schools, referred the spasmodic actions to the lungs.

Lieutenant S. of the royal navy, had been long affected with disordered secretions of bile, and all the symptoms of indigestion and general debility. When he consulted me the Asthmatic attacks came with great violence, and were evidently excited by the occasional state of the first passages in his feeble habit. The use of gentle aperients with stomachics, was followed by that of vitriolic acid and tincture of cascarilla; and afterwards by vitriolated iron, rhubarb, and pulv. aromat. His general habit was strengthened; his sweats left him, his digestion gradually improved, and the fits did not appear during a long period of progressive improvement of general health. In this state he took a violent cold, but he was but little affected in his breathing. His bowels however became more lax than usual, and this disorder after a few days encreased to a purging. I yielded to his wish, and prescribed chalk mixture and opium with rhubarb. The day after he began this medicine, he congratulated himself that the bowel complaint had ceased, but on the second evening he had a very violent return of Asthma. I then prescribed for him a mixture of magnesia and infusion of senna. His lax state of the bowels soon returned, and the fit was suspended after two motions; the diarrhœa only continued a few days and left him well.

But when affections of the liver occasion Asthma, there is a great difficulty in the management of the stomach. If cordials and a meat diet be limited considerably for the purpose of avoiding a turgid state of the liver, the spasmodic breathing is likely to be increased. Such is the habit of an Asthmatic subject, that it cannot be concluded without experience in his case, that evacuants will be beneficial, although the irritating cause be so manifest. Every habit seems to have its peculiar character subordinate to the general principle of the disease; and it is owing to these idiosyncrasies that opposing qualities of medicine are found to be useful in different cases of the same complaint. Which of the acids therefore may be most efficacious cannot be safely asserted without some trial.

The acetous acid has been spoken of (page 289) as best applied when the coats of the first passages are irritated by bilious acrimony, which it may serve to neutralize. This condition is very probably common to Asthmatics, although it be not immediately detected amongst the possible causes of the disease.

The mineral acids are not so likely to answer in relieving the fit as the vegetable acid; but a draught with nitric acid much diluted has been given with advantage in both states. The vitriolic acid has been proved to be a powerful tonic taken three times a day in the intermissions. Tincture of cascarilla adds to its efficacy. The habits in which it was most efficacious were affected with frequent bilious disturbances of the alimentary canal and much dyspepsia, and eruptions of the skin, with general relaxation and weakness. In these circumstances the improvement of health was progressive, and the fit was lost. But the acetous acid cannot be depended upon for relief in the fit; and when dyspepsia, entirely unconnected with bilious acrimony is predominant, testaceous powder is to be preferred sometimes combined with magnesia, and small doses of Ipecacuhan.

Asthmatic attacks take place very commonly when the viscera of the abdomen are turgid, at the same time that the stomach is torpid, and affected with flatulence and acid juices, and the urine is deficient and high-coloured. It is then that soda shews admirable effects, but not very rapidly; it should be given daily with bitters, and rhubarb. It may be united occasionally with an aperient of more force; and six grains of pilul. hydrarg. may be taken every night for short periods; but four or six grains of rhubarb every night, and six grains of soda twice or three times in the day, produce a change in the secretions of the alimentary canal, which may in many instances remove the Asthma without other means. The means, however, of confirming the change of habit, ought never to be neglected—by bitter infusions, and preparations of iron, with a strict diet.

It may be asked, why a more active plan of purging be not adopted when this state of the abdominal viscera is satisfactorily ascertained. The answer is, that the Asthmatic convulsions will be excited by purging and drive the patient to despair. It is possible that a more vigorous practice, (see HAMILTON's *Treatise on Purgative Medicines*) may conduct us ultimately to an improvement in the treatment. It has appeared that the cause of many disorders exists in the alimentary canal, and many convulsive affections have been removed with the irritations of the first passages. But there is no certainty in the effect of this practice when the fits of Asthma have regular periods, and whoever attempts it must have great courage. He must bear the ill humour of his patient, and excite many paroxysms for the uncertain attainment of ultimate success. Where purging is apparently necessary from the cause of the complaint, I have found it most prudent to neutralize acidities, and dissolve viscid secretions, and in the course of this treatment to discharge the irritating matters in a gentle manner.

Those habits in which a more vigorous practice can be adopted, offer exceptions to general rules. In the Asthma, which is produced by swellings and chronic inflammation of the spleen, constant purging by irritating cathartics has been found to be the most efficient means of cure: as is proved by the author in Medico-Chirurgical Transactions, vol. 2—3. article *Splenitis.*

The habit which has been described to be so benefited by mineral alcali, aperients, and bitters, is very nearly allied to the gouty constitution, and to that subject to nephritic complaints; in all of these Asthmatic affections take place, and are capable of relief and cure. Where the gout has predominated in the system, I have with great advantage to the patient, united soda, with fetid gums and aromatics, if the languor of the alimentary canal required these aids. A sour perspiration has been noticed by gouty Asthmatics, though it is an unusual symptom. It is to be treated with a more free use of chalk and alcalis, which by neutralizing the acidities of the first passages, prevent their absorption into the system, and by giving better action to the stomach, cure the disorder.

Of the tonics that have been recommended, cinchona has not appeared to me to be specific in its effect in this disease. The stomach does not digest cinchona rapidly enough to receive its invigorating influence. The energy of the stomach must in all cases be first excited, and through this energy the vigour of the whole habit.

Carbonate of iron has frequently effected cures, as in the case of Millington, without any other combined means. Where the circulation in the lungs is tardy, and the stomach weakened, the use of this mineral is particularly indicated (see page 277). and it is probably owing to this passive condition of the sanguiferous system that its application has been often beneficial even in the paroxysm.

All the preparations of iron, but particularly this oxyd, appear eminently to lengthen the intermissions of the disease, by enabling the constitution to throw off gradually, but certainly, the causes of morbid irritation in the stomach and the lungs. In this view it is entitled to a preference in the treatment of Asthma, not for the cure of the paroxysm merely, but of Asthma itself.

It is probable that during the use of this oxyd, the habit of the patient is most beneficially influenced by a continued evolution of oxygen. This effect may be promoted by giving the vitriolic acid at the same time, though the degree of excitement that is the consequence of this combination can scarcely be borne in all cases.

In No. 96, of the *Annales de Chymie,* oxygen is considered medicinally in a disease of the skin. I have often observed that the skin has been improved, and that eruptions have disappeared during a course of oxyd of iron, an effect that took place in the case of Mr. Parish.

A febrile state of the system sometimes follows the use of preparations of iron, but this state only shews that the medicine should be discontinued, and the permanent increase of constitutional vigour is not less certain. They are applied with most speedy advantage when the body is not disposed to be feverish in the intervals, but is pale, fleshy, or fat, the bowels being lax, with the stomach weak and flatulent. I consider the rust of iron as the most quiet in its action; it may be given from ten grains to sixty, twice in the day. The ferrum præcipitatum and sulphate of iron are also eminently efficacious, but they must be given with more precaution as to the dose.

The indiscriminate use of the smoke of Stramonium, has occasioned dangerous or hurtful effects in frequent instances. In some cases of aged or apoplectic subjects, death has been the consequence. No considerate physician can countenance the latitude of its application, or advise its use without well knowing the nature of the case of Asthma on which he is consulted.

Some patients have taken quicksilver in large doses. One gentleman, who had been afflicted a great number of years with Asthma, was advised to take an ounce of crude quicksilver every night. He swallowed on the whole four pounds, and he had no paroxysm for an unusual length of time. He however informed me, that "it destroyed his "appetite, and he was persuaded that it would "have killed him if he had continued it. A Phy-"sician advised him to take no more of it."

Crude quicksilver has been given in many cases, but without benefit, unless the viscera were obstructed. When it was really useful, a febrile state, and an affection of the gums shewed that it had influenced the constitution, but the patients were much weakened in consequence.

A gentleman, who is an acute reasoner in all subjects of science, and who has had particular motives for attending to this disease, informs me that he never slept at Kilkenny without being attacked by Asthma, though the late Lord Ormond was generally seized with a fit when he slept out of that town. The Kilkenny air is thought to be strongly impregnated with carbonic acid, from the combustion of a particular species of coal. The lungs of Lord Ormond were too irritable to bear the stimulus of a purer air. On the contrary, Mr. T. believes that from the slower circulation and weaker action which the same air produced in himself, the moisture of his lungs was not carried off as rapidly as it would have been in a purer air, and a fit of Asthma was the consequence. From much observation of this gentleman's disease, I may be allowed to add, that the exciting qualities of oxygen are required for the healthy exercise of his other functions as well as that of the lungs; and that any deficiency in the proportion of the pure part of the atmosphere must in every place be injurious to his irritable constitution.

The inquiry into the manner in which respiration is influenced by natural causes, and particularly by the qualities of the inspired air, has occasioned many experiments by chemical philosophers. The subject, it is hoped, will be pursued by Dr. Bostock, whose knowledge of the gases is calculated to assist the investigation of the physiology of respiration which he has begun with so much accuracy, and success.

To the list of symptoms of Asthma, there may be added some anomalous feelings which do not often attend; one of these requires a particular notice. In those subjects who are sometimes affected with sweats about the head and neck, and great disorder of the stomach from acidities and distention, a distressing pain affects the integuments of the head, and generally at the back of the head. It is not attended with any symptom of fulness of the vessels, and is not relieved by cupping, leeches, blisters, or purges. Stomachic and Volatile medicines, with testaceous powders and gentle diaphoretics, alleviate this complaint, as I have often experienced in cases that had been treated without success by evacuations locally and generally. It seems therefore to be very sympathetic with the first passages, but in addition to the internal means, an embrocation of volat. aromat. spt. with camphor, and alcohol, gives considerable relief: and a perfect removal of the complaint has been effected by the following plaster applied to the part, after the hair had been shaved off, viz.

R. Empl. Lythargyri ʒ ij.
Opii puri
Camphoræ āā ʒ ss
Ft. Emplastrum.

When the First Species takes the character of the Second, in irritable and thin habits, a change of treatment is necessary, and it would be hazardous to neglect it. Tonics must be no longer prescribed, but antispasmodic and saline medicines, pursued for only a short time, will remove the new symptoms, and the Asthma is less likely to return, than if they had not occurred. I have seen this change take place in several instances, and I have observed that it was followed by a more rapid improvement of health, and the absence of fits of Asthma.

After the first delay of the paroxysm, it often happens, that the next return is more violent. The patient should be prepared for this circumstance, whilst he feels his improved health. The additional violence of the fit is the effect of increased vigour in the muscles, which are now capable of stronger action. But if the paroxysm be stronger from this change of habit, the length of the intermissions will be greater, and the cure nearer to our reach. Antispasmodics may then be used with greater freedom, and tonics become less necessary.

As evidence of the utility of these hints, it is in my power to offer numerous cases. The medical reader will however understand why the exact publication of cases of chronic diseases, which had been treated before I saw them, by men of the highest reputation in the profession, may be to me unpleasing, and to others apparently invidious.

I have spoken facts, that they may furnish principles for general consideration and use, and I shall consider the application of these principles by other Physicians as an honour to my reputation, and the best reward of my labour.

FINIS.

BARNARD AND FARLEY,
Skinner Street, London.